Continuing the Conversation

A Newsletter on the Ideas of Gregory Bateson

Issues number 1–7 and 19–24

A Newsletter of Ideas in Cybernetics

Issues number 8–18

Official newsletter of the American Society of Cybernetics, ASC, issues number 6–18

This newsletter features numerous significant contributions related to Gregory Bateson, Cybernetics and Perceptual Control Theory.

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Continuing the Conversation

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SUMMER SOLSTICE 1985   Editor, Gregory Williams   **NUMBER 1**

"Continuing *What* Conversation?"

Welcome to the inaugural issue of *Continuing the Conversation!* The notion of providing some sort of regularly appearing forum to facilitate networking and scholarship related to the ideas of Gregory Bateson has been discussed by Bateson enthusiasts over the past few years; plans for this newsletter were finalized at The Pattern Which Connects" Symposium (see article below). At that Symposium, the tone/mood/style was *conversational* throughout its many wide-ranging discussions, some formal and others informal, SORE focused sharply and others not, with ideas growing, collapsing, doubling back on themselves, sometimes even turning inside-out (to use somewhat overly physical metaphors). *Continuing the Conversation* is an attempt to carry on in the conversational domain established at the Symposium, and to involve many who were not at the Symposium in that domain.

This first issue of *Continuing the Conversation* is being sent to about 160 individuals on the Symposium mailing list and to about 60 additional individuals and institutions known to be interested in the ideas of Gregory Bateson. Most of this issue has been compiled and written by the Editor, but *the goal is a largely reader-written newsletter.* Whether this goal can be reached constitutes an experimental question. To the extent that it is answered affirmatively, we shall be truly "continuing the conversation". In other words, reader feedback is essential! *Please* share your ideas, information, critic details on upcoming events, etc., etc.—some reader is going to be interested, no matter how trivial or tangential your contribution. Thank you.

The experimental nature of this endeavor means that every aspect of format, emphasis, size, and publication frequency is subject to change. If there is little or no response (see page 3) to this issue, a second issue will not be forthcoming! Subscription prices are set to allow expenses to be covered even with increasing issue size (prorated refunds will be given if the newsletter folds).

About "The Pattern Which Connects" Symposium

From May 4th through May 7th, 1985, the College of Saint Benedict, St. Joseph, Minnesota, sponsored The Pattern Which Connects: A Symposium on the Questions of Gregory Bateson". The Symposium proper, which began on the evening of May 5th, and included addresses by Dr. Mary Catherine Bateson and six scholars well acquainted with Bateson's work, was preceded by a conference for a small group of individuals working in Bateson's tradition. Dr. Tyrone Cashman convened the Symposium after having devoted two years to "catalyzing" intensive study of Bateson's ideas by students and faculty at the College of Saint Benedict.

Cassette tapes of the seven Symposium addresses are available for $ 3.50 each (checks payable to the College of Saint Benedict) from Maureen Opitz, Bateson Symposium Coordinator, Box 202, Rice, MN 56367:

Dr. Mary Catherine Bateson, "Ecology Two-Step" (Keynote)

Dr. John Stolz, "Gala: The Biota as a Cybernetic System"

Dr. Humberto Maturana, 'A Biology of Cognition"

Matthew Fox, 0.P., "In Pursuit of the Nontrivial: The Pattern Which Connects in the Mysticism of Hildegard of Bingen and Meister Eckhart"

Lynn Hoffman, "Beyond Power and Control: Developing a Systemic Mind"

Michael Opitz, "What's a Meta For? The Appropriateness of an Aesthetic Epistemology"

Ernst von Glasersfeld, on radical constructivism.

Plans are to publish proceedings of the Symposium; the proceedings will not include details of the pre-conference, and so it is appropriate to mention here a few of the ideas which "bubbled up" in the rich stew of conversations:

"Give me the context and I'll tell you no lies." (Lynn Hoffman)

Good therapy as asking liberating questions?

Better to be *between* languages than in one?

Solving vs. dissolving ethical "problems".

"Gregory really *thought* from his *heart."* (Lois Bateson)

Language as a maladaptive addiction? Can a change in language "cure" an addiction—for example, what if nuclear armaments were publicly relabeled "suicide devices"?

Two ways to develop trust (i.e., in an arms race): bonding or being led to the brink and then being pulled back from it at the last moment.

Possibilities for ethics without "selves"?

Organismic ("homeostatic") models as *poor* ones for families?

Epistemology *without* a "detached" observer.

Art as the context for developing ideas in societies. "Everything connected" is terrible—but so is "everything unconnected".

Beware the false separating-out of "aesthetics"; art is not "the expression" of aesthetics.

Only questions—no statements—in aesthetics? Neurophysiology as a conversational domain?

Linearity vs. circularity in questioning.

Torn from context and, in most cases, stripped of attribution, these lines seem pretty oracular, no doubt; but giving them here might provide some idea of the convoluted patterns of discussions during the pre-conference. Maureen Opitz has compiled a mailing list of Symposium participants.

Bateson Tapes Available from Pacifica Radio Archive

Collectors of audio tapes of talks by Gregory Bateson will be interested in four cassettes available from Pacifica Radio Archive (5316 Venice Blvd., Los Angeles, CA 90019):

"An Anthropologist Views the Social Scene" (BB2368)

"Interview with Gregory Bateson" (BC3091)

"Psychiatry and the 'Double-Bind' Theory" (BB1363)

"The Roots of Peace" (BB0224).

Write to Pacifica for current pricing information. "The Roots of Peace" is particularly significant: a detailed examination of the arms race. The "Interview..." was done while Bateson was teaching at the Naropa Institute, in 1975. "Psychiatry..." dates from 1970, and "An Anthropologist... from 1960.

Bateson Videotapes

"Metalogue on Healing and Cancer", a 75-minute videotape with Gregory Bateson and David Berenson, was shown at The Pattern Which Connects" Symposium. This videotape can be purchased or rented from IEA Productions, Inc., 520 E. 77th St., New York, NY 10021 (Phone: 212-988-9244). IEA also sells/rents a seven-hour (0 videotape of a 1979 seminar with Gregory Bateson, titled The New Epistemology". More information on these videotapes is given in the current IEA catalog, available on request.

Are there any other Bateson videos known to CC readers? Let us know!

Financial Support Needed for Bateson Archival Work

The correspondence, papers, tape recordings, and films of Gregory Bateson are divided among several institutions: The bulk of materials from Bateson's career, until the end of World War II, is in the Margaret Mead Collection, Manuscript Division, Library of Congress; later materials are concentrated in McHenry Library of the University of California at Santa Cruz; Bateson's personal collection of tape recordings (more than 500 cassettes, mainly talks given by Bateson himself) is housed in the McHenry Library, and a duplicate of the collection is at the Lindisfarne Press, West Stockbridge, Massachusetts; and a collection of Bateson family papers is available through the American Philosophical Library in Philadelphia.

Rodney Donaldson, who was Bateson's doctoral student in anthropology, is the official archivist for Bateson materials. He has been organizing and cataloging for over two years, but the enormous task is not yet completed. There is a need for financial support to aid in this project, which has been supported in part by The Institute for Intercultural Studies, Inc., a nonprofit, tax-exempt organization founded by Margaret Mead in 1944, and the literary executor of Gregory Bateson's estate. Tax-deductible contributions or grants may be made to the IIS, earmarked for work on the Bateson papers". For additional information, write to IIS, c/o Sloane & Hinshaw, 145 E. 74th St., Suite 1C, New York, NY 10021, or to Dr. Rodney E. Donaldson, P.O. Box 957, Ben Lomond, CA 95005.

A Computer Program for "Getting Unstuck"

By Michael Tannenbaum, 19 Alcina Ave., Toronto, Ontario M6G 2E7, CANADA. Copyright 1985 by Michael Tannenbaum. (A poster paper at The Pattern Which Connects" Symposium, reprinted with permission of the author.)

The following is an example of a sub-program I would write within a larger computer program to break the addictive aspects of computer usage. I mean to say that I wish I could write a program to remind me that I ought to stop programming once in awhile—this would be my vision of recursion, and it might apply to any situation where I feel 'stuck'.

```
STORE "EYE" TO VISION
STORE "OFF" TO AUTO
SET TALK ON

DO WHILE BELIEF = "ON" .OR. "OFF"

    IF BELIEF = "OFF"
    STORE "MUDDLED" TO BELIEF
    ENDIF

    IF BELIEF = "MUDDLED"
    STORE "OFF" TO JUDGMENT
    READ BATESON
    DO RECONSIDER
    STORE "ON" TO BELIEF
    WRITE APOEM
    ENDIF

    IF BELIEF = "ON"
    READ MATURANA
    STORE "FROG" TO VISION
    SET TALK TO FROG ENDIF

    STORE "ON" TO AUTO

ENDDO LOOP
```

Dissertations and Theses on Bateson's Ideas

Attention to Gregory Bateson's notions appears to be increasing in the academic world. The following list includes all Bateson-related dissertations and theses known to the Editor of CC (write if you know of others!).

Frederick A. Blount, Jr., "Gregory Bateson and a Language for Psychotherapy", Ed.D., University of Massachusetts, 1976. Available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, MI 48106 (Publication No. 76-14671).

Jo M. Hannah, "A Study of Listening from the Ruesch Bateson Theory of Communication", Ph.D., University of Denver, 1961. Available from University Microfilms International (Publication No. 62-01219).

Bradford P. Keeney, "Cybernetic Patterns in Family Therapy: A Batesonian Epistemology", Ph.D., Purdue University, 1981. Available from University Microfilms International (Publication No. 81-23663).

Neill Kramer, "The Implication of Gregory Bateson's Ideas for Contemporary Education", M.S., University of Oregon, 1983. For availability information, contact Neill Kramer, 9 Lafayette Park, Rochester, NY 14607.

Patrick J. Openlander, "Gregory Bateson: Analysis and Positivist Critique", Ph.D., Saint Louis University, 1981. Available from University Microfilms International (Publication No. 82-07426).

Charles E. Schwarz, "The Self and Related Concepts in the Social Philosophies of George Herbert Mead and

Gregory Bateson", Ed.D., Rutgers University, 1978. Available from University Microfilms International (Publication No. 78-10238).

David Shiner, "Epistemology in the Work of Gregory Bateson", Ph.D., Pacific Western University, 1983. For availability information, contact Dr. David Shiner, 426 N. Sheridan, Waukegan, IL 60085.

Joseph L. Watras II, "An Investigation into Gregory Bateson's Concept of Deutero-Learning as Applied to the Contemporary School Setting", M.Ed., University of Hawaii, 1969. For availability information, contact Hamilton Library, University of Hawaii, 2550 The Mall, Honolulu, HI 96822 (Publication Call No. Hawn./LB5/H3/no. 165).

About Gregory Bateson

Here are a few items on Bateson's ideas "hiding" in fairly obscure places:

Phoenix: Journal of Transpersonal Anthropology dedicated Volume 5, Number 2 (1981) to Margaret Mead and Gregory Bateson. Included in the issue are Philip Staniford's "Bateson and Mead: A Personal and Transpersonal Reflection", correspondence between Staniford and David Lipset (Bateson's biographer), and "Nature, Mind, and Consciousness: Gregory Bateson and the New Paradigm" by Stanislav Grof. *Phoenix* is published by Association for Transpersonal Anthropology, 2001 Tibbits Ave., Troy, NY 12180. (Thanks to Gary Ronjak for this reference.)

"The California Unconscious" by Thomas A. Bass (The *North American Review* 267(1), March 1982, 4-10) is a riotously funny exploration of the Santa Cruz culture in which Bateson was immersed for several years. Bass writes of the "cafe set" with copies of *Steps to an Ecology of Mind* (and Hegel, and *Love's Body)* under their arms, critiquing (almost) everything...

A Symposium on Bateson's *Mind and Nature: A Necessary Unity* was part of the International Interdisciplinary Conference on Thinking held at the University of the South Pacific, Suva, Fiji, January 1982. Several papers from the Symposium are published in *Thinking: The Expanding Frontier,* William Maxwell, ed., The Franklin Institute Press, Philadelphia, 1983.

In preparation for the National Symposium at the College of St. Benedict on The Pattern Which Connects", interested faculty at that institution participated in two "mini-symposia" "On Some Applications of the Ideas of Gregory Bateson". Proceedings of these events have been published in two volumes by the College of St. Benedict. Papers included in the first volume: Opening and Closing Addresses by Tyrone Cashman, "Bateson's Ideas as They Relate to Feminism" by S. Linda Kulzer, "Bateson and Semiotics" by Thomas Daddesio, "Bateson and Psychology" by Allan Davisson, "Thoughts on a Theory of Metaphor" by Michael Opitz, "Bateson and Economics" by Lawrence A. Waldman, "Bateson and Family Systems Therapy" by Patricia Beckler, and "Is Unity God?—Bateson, Reality and *Me"* by Ronald Lane. In the second volume: Opening and Closing Remarks by Lawrence A. Waldman, "The Role of the Aesthetic in Bateson's Thought" by Michael Opitz, "Reflections on an Almost Lost Tradition" by S. Dolores Super, "Putting Psychology Back Together—Some Help from Bateson" by Nancy VanDerveer, "Bateson and a Narrative Approach to Christian Ethics" by Steve Heymans, "Paradoxes in Communication at Work" by Barbara Leuin, "Bateson and the Philosophy of Science" by Phillip Durkee, "Character Is Fate?" by Martin Andrews, and an Introduction explaining the involvement with Bateson's ideas at the College. For information on the availability of these books, send a self-addressed stamped envelope to Maureen Opitz, Bateson Symposium Coordinator, Box 202, Rice, MN 56367.

And an interesting paper in a not-so-obscure place: "Gregory Bateson, Alcoholics Anonymous, and Stoicism", Victoria Brundage, *Psychiatry* 48, February 1985, 40-51.

Upcoming Events

Dr. Avery Johnson has designed a conferencing system allowing *up to 25* simultaneous telephone communicators. Bateson appreciators are invited to call 617-5998844 on Wednesday, July 10, 1985, at 8 PM (EDT) for discussions with (up to 24!) others!

Beginning in mid-July, Dr. Johnson is sponsoring informal weekend seminars ("The Quarry Metalogues") for those interested in Bateson's ideas. Probable central issues for the Metalogues include Epistemology, Family Therapy, Aesthetics, Evolution, Autopoiesis, Abductive Logic, Constuctivism, Applied Comple-

mentarity, Intention/ Intension, etc., etc. Limited overnight accommodations, but excellent camping sites; meals managed by participants. Swimming. Spouses and children welcome ; no pets. To find out who will be attending, phone 603-673-8070 during the preceding week for a recording of the roster and to add your name. No fee for participants.

Dr. Johnson' s address is: Armory Rd., Milford, NH 03055. Milford is 12 miles west of Nashua, about one hour's drive from Cambridge, Massachusetts. The quarry is eight tenths of a mile from the eastern end of Armory Rd., which is at a crossroads on Rt. 13, just south of where the "Milford Bypass" (Rt. 101) arches over Rt. 13. Look for mailbox marked "JOHNSON".

Correspondents Wanted

On Bateson and education (especially, design of interdisciplinary curricula): Neill Kramer, 9 Lafayette Park, Rochester, NY 14607.

On Bateson and environmental ethics: Gregory Williams, Rt. 1, Box 302, Gravel Switch, KY 40328.

On introducing Bateson's ideas to Japan: Toshihiko Hasegawa, Dept. of Surgery, The Shiga University of Medical Science, Seta Tsukiwa-cho, Otsu-shi, Shiga 520-21, JAPAN. (Dr. Hasegawa is fluent in English.)

On placing Bateson in the Western philosophical tradition: Dr. David Shiner, 426 N. Sheridan, Waukegan, IL 60085.

Work In Progress

Michael Yocum (437 W. 2nd St., Apt. 7, Lexington, KY 40508) is preparing a monograph on the informational/relational bases for physical and biological evolution.

Dr. John R. Neill (Dept. of Psychiatry, University of Kentucky Medical Center, 800 Rose St., Lexington, KY 40536) is researching the history of uses of hallucinogens in psychiatry, including the contributions of Gregory Bateson to this field.

Paul Ryan (P.O. Box 862, New York, NY 10268) is continuing study on the philosophical systems of Charles S. Peirce with regard to Bateson's utilization of the theory of logical types.

Editor's Choice

(One or two selections from the published works of Gregory Bateson will be listed in each issue of CC, to promote their wider appreciation. Emphasis will be on less well-known papers .)

Maya Deren and Gregory Bateson, "An Exchange of Letters between Maya Deren and Gregory Bateson", *October* (14), 21-46, 1980.

Please Return This Form If You Are Interested In Receiving Future Issues Of *Continuing The Conversation*, Your Name Will Be Removed From The Mailing List Unless You Respond By September 1, 1985,

To: *Continuing The Conversation*, c/o Hortideas, Rt, 1, Box 302, Gravel Switch, Ky 140328 U.S.A.

❑ Enclosed is $ 2 ($ 3 outside North America, U.S. funds only) for a subscription to the next two issues of *Continuing the Conversation* (Fall Equinox and Winter Solstice). I understand that my remittance will be refunded if there is insufficient response to justify continuing publication of *CC.*

❑ Enclosed is $ 1 each ($ 1.50 each outside North America, U.S. funds only) for _____ additional copies of the first issue of Continuing the Conversation. Please send to address(es) as noted below and on attached sheet(s).

NAME_____

ADDRESS _____

PLEASE PARTICIPATE IN THE CONTINUING CONVERSATION BY SENDING: COMMENTS

SHORT PAPERS

BOOK REVIEWS

REPORTS ON RESEARCH

ANECDOTES

DETAILS ON UPCOMING EVENTS

REFERENCES TO MATERIALS BY AND ABOUT BATESON

SUGGESTIONS FOR THEME ISSUES

ADDRESSES OF BATESON ENTHUSIASTS, WORLDWIDE

INFORMATION ON BATESON-RELATED ACADEMIC COURSES/STUDY GROUPS

SOURCE LISTINGS FOR BATESON MATERIALS (ESPECIALLY TAPES)

IDEAS FOR CORRESPONDENCE NETWORKS ON PARTICULAR TOPICS

QUESTIONS (ESPECIALLY QUERIES CF THE FORM "WHERE DID BATESON SAY ...")

BIBLIOGRAPHIES/REFERENCE LISTS ON BATESON-RELATED TOPICS

REPORTS ON RECENT EVENTS

JOKES, RIDDLES, AND TALES

SUGGESTIONS FOR RESEARCH

AIDS TO BATESON SCHOLARSHIP (HISTORICAL CLARIFICATIONS, ETC.)

REMINISCENCES, PROJECTIONS, AND PREDICTIONS

AND WHATEVER ELSE!

GUEST EDITORS ARE WELCOME ...

ALL CONTRIBUTIONS RECEIVED WILL BE CONSIDERED FOR PUBLICATION UNLESS OTHERWISE REQUESTED.

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DEADLINE FOR THE NEXT ISSUE IS SEPTEMBER 1, 1985.

Continuing the Conversation

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Ideas of Gregory Bateson

Fall 1985　　　　　**Editor, Gregory Williams**　　　　　**NUMBER 2**

The "Conversation" Continues…

Response to the first issue of *Continuing the Conver*sation has been sufficiently enthusiastic to guarantee at least a few more issues. Currently, there are about 50 paid subscribers, and this issue is being sent to over

200 individuals and institutions thought to be interested in the ideas of Gregory Bateson. For newcomers to the "conversation", the history of this newsletter goes like this: The notion of a regularly appearing forum to facilitate networking and scholarship related to the ideas of Gregory Bateson has been discussed by Bateson enthusiasts for several years. The decision to begin publishing Con*tinuing the Conversation* was made among a group of Bateson scholars at 'The Pattern Which Connects: A Symposium on the Questions of Gregory Bateson", convened by Dr. Tyrone Cashman at the College of Saint Benedict, St. Joseph, Minnesota, in May 1985. At the Minnesota Symposium, a *conversational milieu* developed; this newsletter is an attempt to continue that milieu, and to involve many who were not at the Symposium in the ongoing "conversation".

One goal of the Editor is that *Continuing the Conversation* become a largely *reader-written* newsletter. With several interesting contributions from readers in this issue, it appears that the goal is not an unreasonable one. But we need *your* inputs to make sure the conversation continues! *Please* share your ideas, information, criticisms, and, above all, responses to the ideas expressed herein. Thank you!!

Transformation

By Greg Bechle, 33 Pine St., Amherst, MA 01102. Copyright 1985 by Greg Bechle.

When I close my eyes these days just before going to sleep I see a face floating in the darkness. It is a woman's face, and it is completely beautiful and seems filled with light, partly because it is surrounded by the most mysterious and mystical darkness.

And when I see this face I think of transformation. And I begin to realize that all of our faces are places, or maps, or vehicles of transformation. There is a world out there, the world outside of our faces, with trees, and clouds, and many wonderful and terrible things, and then there is the face, the boundary or border, and on the other side of this boundary there is yet another world, no less mysterious and wonderous, and this world too has its structure and forms and images. And both worlds are transformations of each other.

I hope that some day you can travel to Vancouver Island. It is an emerald temperate rain forest, and there are so many things there that speak of the earth's wildness and mystery. I remember once pitching a tent on a wild sandy beach near a tidal pool into which the ocean was slowly and gently rising. And the sun was setting then, on a vast expanse of the Pacific, and to the South the white peaks of the Olympic Peninsula were standing above the green, somehow regal and serene. And at the same time a full moon was rising in yet a different sector of the sky. And right in the middle of this was my tent, and near the tent was a gnarled tree in which a fierce bald eagle was peacefully resting. And I felt

somewhere in my heart that all of these things were trans formations of each other. And if you go to the museum on the island you can see the transformation masks, which show a bird or an animal on the outside, but at an important point in the play they pop open and reveal a person, or another being.

And from the same old culture there are places where transformations take place, but in a more concentrated form than usual. Here, there are pictures on the rocks, and some of the pictures are of birds, or of animals, or of other beautiful things in nature. Yet other pictures are of the mind's strange mythic beasts and elaborate designs. And some pictures are combinations of both.

And I want to say that the Indians carved pictures there, but that is not exactly true, then I want to say that the pictures carved themselves, but that is not true either. The closest that I can come in this clumsy tongue is to say that as people transformed the rock into images, the images transformed the people into beings who understood the sacredness of relationship; and these images developed out of a relationship between the carvers and the place.

These images suggest a way to a wider view of things, a view in which the face becomes a bridge, a connector, a mediator, rather than a boundary between worlds.

Once I walked to a place of the pictures. It was in a field near some woods that were hushed, and salmonberries grew there. And carved in the rock was a hummingbird.

And I had some canvas and some chalk, and I was there to transfer the hummingbird from the rock onto the surface of the canvas. Or, even more correctly, I was taking the hummingbird, which was actually pure space carved into the rock, and turning this space into a portable form.

But I felt strange just taking the image. The reasons should be clear. Unlike the hummingbird maker, I come from a culture that has forgotten the sacred. Standing in the serene woods in this sunlit field I felt marvel, and connection, which the act of taking would destroy. I was in a church, or a temple, because most churches feel like this. They imitate the forests or special natural places where there is a feeling of connection.

In most places and in most times people have spent the majority of their days building temples or bridges to the sacred. In India there are beautiful temples with fantastic art, all of it unsigned. The people took their surplus goods and labor and love and built places for transformation. Every society has done this, even ours. But where are our temples?

The only thing that is the overarching temple is our creation of elegant, beautiful, and breathtaking atomic weapons and control centers. The type of labor, the obsessive fascination, the hierarchy of the priesthood, all are religious functions. When the first bomb went off, the first words were "I Have Become God, Destroyer of Worlds" and it is true that the priesthood is worshipping Shiva, God of Death. And this worship will lead to a truly great and painful transformation, the reordering of this world.

So, coming from this religion, that of death, taking, and opposition, I hesitated. I did not know how to approach the holy. I did not want to draw the hummingbird of space into my world.

So, I picked some flowers and put them on the hummingbird. And I said a little prayer.

"It is not just to take something that I
create these forms, hummingbird.
I do it in the hopes that I can see
how you and all beings are connected
on the planet."

And just at that moment a hummingbird dropped out of the sky, and hovered near my face. He said, "de, de, de, de" and then flew off into the tranquil forest. For the briefest of moments my face had become a connector, the hummingbird popped out, and the worlds came together.

Let us hope together that in the days of Shiva we may create such religion of connection.

Bateson and Phenomenology

By Michael Yocum, 437 W. 2nd St., Apt. 7, Lexington, KY 40508. Copyright 1985 by Michael Yocum.

Dear Greg,

Continuing *which* conversation?

I didn't attend The Pattern Which Connects Symposium, so I didn't participate in that conversation. When I saw the title of the newsletter I immediately recalled another conversation. What I remembered was the first time I sat down and read Gregory Bateson's papers.

In the early 1970's, about a year before the publication of *Steps to an Ecology of Mind*, I was working in London with a lot of people who had managed to get themselves tagged "schizophrenic". At the same time, several of my colleagues and I were starting up a small private library. Bateson sent the library all of his papers listed in the *Steps* bibliography, plus a few unpublished things. A couple of months after they arrived I photocopied the complete set and took them to a small fishing village in Cornwall, where I had rented a cottage for a fortnight's winter vacation.

There were gales. The first night I awoke to find walls of sea crashing through village streets and the wind howling madly, impersonally yet with a ferocity I had not heard before (nor have I since). For a few hours I was alarmed, but at dawn I saw that the village was holding its own. The ancient stone buildings had been there for centuries, constructed with such weather in mind. So I relaxed. During stormy days I stayed indoors by the fire, reading Bateson. When the weather cleared, I would read in the morning and then go out to the chip shop for lunch. From there I would stroll down to the beach and along the shingle, or venture west a few miles along the cliffs near Land's End. After rambling most of the afternoon I would return and read Bateson in the evening.

That part of the British Isles lies directly in the Gulf Stream and is warmed by it. So although it was late winter, on my sojourns through the countryside I occasionally came across small clumps of *Primula vulgaris*, the wild English primrose, blooming early on sheltered banks.

In that context—of "schizophrenia", of the peaceful grandeur of the sea alternating with tempests from *King Lear*, of many long centuries of spirited human endurance, and of the year's first primroses, gently and unassumingly beautiful—my conversation began.

What I am trying to say is that I, like many others, have been deeply moved by Bateson's work; moved in "heart", "mind" and "spirit". Reading Bateson is more like a conversation than many conversations I have had. If he was right about the nature of mental process, then ideas which were immanent in his relations with the world are now to some degree immanent in us, his readers, students, admirers. Just as ideas are not confined to the organism, so they do not die with it but with the absence of circuit. If they are to continue living, the ideas which were a part

of Bateson (or of which he was part) now must find embodiment in us, in our relationships. If we are not open to those differences, and to making differences to each other, the circuits will cease to exist. I take it that the newsletter is intended to provide one medium, or relay, or point of closure, for the circuits of difference which make a difference; for continuing to explore (and maintain) a pattern which connects.

I greatly value the conversation which began for me one winter long ago in Cornwall, and I very much hope it continues. Enclosed are a few words I want to add to it now about Bateson and phenomenology.

Yours,
Michael Yocum

Speaking of phenomenologists in one of the Naropa tapes Bateson complained, "I never know what 'it' is that they refer to." (1)

To drive home his point he paraphrased Lewis Carroll: "It to me", said the Duck to Alice, "is usually a frog or a worm."

Much phenomenological writing is notoriously difficult and obscure (but so is Bateson to many). "It" is often never unequivocally defined, but teased out into so many historical and experiential contexts that what began as a clearly outlined object or concept, ends as a complex interweaving impossible to delimit, let alone define precisely. Some people believe that phenomenologists employ this style because they have little worth saying but are adept at hiding the fact, even from themselves.

I knew one who called his teasing out "creative obfuscation"; and I believe many would reply that they are not being obscure at all, that life and experience are multi-vocal (many-voiced) rather than univocal, as science strives to be. The phenomena which concern them, like those Bateson wrestled with, are complex and alive, ultimately irreducible to decontextualized "facts" by cutting and flattening the living richness and complexity of experience into a fixed system, scientific, philosophical, or otherwise.

To specify exactly what "it" means when dealing with such phenomena would be to combine at least two errors Bateson regularly warned against: removing "it" from its evolving context, and then mistaking the map for the territory. In the realm of human experience, "it" can never be specified with the unequivocal (not-equal-voiced) precision science demands because "it" depends upon context and experience, while science attempts to delete contextual and experiential variations from rigorous definitions of "it".

"The fool sees not the same tree that a wise man sees", wrote William Blake.

Science might well agree yet insist that there is a tree, and that the tree is "it".

Phenomenology might reply: No, that "tree" is your "it", or your instruments' "it", or a poet's "it", or a bird's "it", and so on. No doubt there is a tree, but you will never have absolute or pure knowledge of it. There is no pure experience. You can never know what it, as an object, is. The map is not the territory. You may think you can know or conceive of it. But your knowledge and conceptions are only "it". Your "tree" is inseparable from you, just as a bird's "tree" is inseparable from the bird. Science is popularly believed to occupy a unique position, that it can know the truth. But all science can know is its truth.

In phenomenology, as in the special theory of relativity, there is no privileged position, no point of view absolutely more valid than others. You cannot stand outside of the universe. The phenomenological attitude is, if not equivocal, certainly multivocal. In practice this means that phenomenologists, as a rule, are a frustrating lot, given to endless questioning and skepticism: "Yes, that's all very well, but..."

The end lies not in final definitions, but in the journeying.

So phenomenology would quarrel with most if not all attempts to bring scientific rigor into the study of human affairs. Rigor,

yes; scientific, no. In fact, the scientific attitude, applied to human experience, destroys rigor.

* * *

In spite of their differences, Bateson and phenomenology share an insistence upon the importance of care and respect as modes of knowing the world. This diverges from the scientific attitude, where objective dissociation is the preferred stance.

In 1977, Bateson wrote that the notions of "objective" and "subjective" were "obsolete" in his epistemology. They had been replaced by "a combining or marriage between an objectivity that is *passive* to the outside world and a creative subjectivity, neither pure solipsism nor its opposite." (2)

With regard to being and knowing, a fundamental phenomenological concept is *dasein,* a term coined by Heidegger which resonates with Bateson's later thoughts about his own epistemology. *Dasein* is "there-being", the basic mode of human existence. For Heidegger, *dasein* is not a "self" or "mind" separate from and directed towards "objects" "in" "the world". Rather, dasein is always and most essentially a *concerned activity which* is *inseparable* from the world. In 1927 he wrote, "Self and world belong together in the single entity, the *Dasein.* Self and world are not two beings, like subject and object, or like I and thou, but self and world are the basic determination of the Dasein itself in the unity of the structure of being-in-the-world." (3)

Think about it.

In Western cultures, this idea is contrary to almost all that we have been taught for the last two thousand years about the sort of creatures we are. In traditional terms, *dasein* hardly makes sense.

Heidegger is not saying that this is how we *should* or *might* be. He is saying that this is the essence of how we are. It is our mode of *being.* His words are not moral or exhortative, but descriptive. Take them literally. As *dasein,* "we" are inseparable from "it".

How and what we know is not a matter of "thoughts" "i n" the mind" about "objects" "in" "the world", but a pattern or patterns of shared activity in shared contexts. Knowing is an inflection of dasein, one's mode of being. Knowledge is not something one "has" or "acquires", but that which one is or *becomes.*

If Heidegger and Bateson were right, we are in error about both a fundamental unit and the modality of that unit. The relevant boundaries of recursive processes do not arise and are not to be drawn around indivisible chunks of matter, but indivisible organizations of activity. If this is so, the transformation of our reference frames and basic units with regard to mind and order parallels the transformation wrought in physics by relativity and quantum theory. Similar proposals already have been made for biology and cognition by Maturana and Varela (4).

Dasein corresponds to only one stage in Bateson's hierarchy of mental processes, the human one. Phenomenology is rooted in the European tradition and is explicitly concerned with human experience. It has nothing to say about porpoises or beetles or redwood forests unless they come within the realm of *dasein.* But perhaps phenomenology may be of interest to those touched by Gregory Bateson's ideas, even though confining itself solely to that level of existence.

* * *

The only meeting between Bateson and phenomenologists about which I can speak from experience took place in London, in October 1975 at the home of R.D. Laing. Apart from Bateson, the only other non-phenomenologist present was Francis Huxley, like Bateson an anthropologist and scion of one of Britain's half-dozen leading families in the intellectual aristocracy. The rest of us were psychiatrists, psychotherapists, and social workers, all with a phenomenological bent. The gathering was completely informal and with wine flowing lavishly, very amicable. Later in the evening Bateson would say that in America he had been asked how best to promote stimulating conversation between faculty and students at his university. He had suggested laying in an extensive wine cellar, like those of the great British universities, so that students and professors could gather over a few bottles of good wine. Then thoughts and conversations would flow. But, he lamented, state-funded American institutions could not be persuaded of the wisdom of spending public money on stocking university wine cellars, so the idea had come to nothing.

Bateson had given a public talk in London a day or so earlier. Afterwards one of our group had driven him up to Cambridge. He had collapsed there, and opening remarks that evening at Laing's centered on his health. Speaking of his lungs, he said simply, "They're shot." Then, talking about the necessity of death, he asked for a copy of *Our Own Metaphor* so that he could quote Warren McCulloch's thoughts about dying.

Conversation turned to the beginning of life. Someone asked about the minimal limits of the unit of study for individual human beings. Did it begin at birth or conception? "Conception", Bateson replied firmly.

We then moved on to talk about patterns of growth in the embryo. Bateson spoke at length about the frog's egg and the origin of visceral asymmetry. Laing wondered whether the information necessary for asymmetry might be imparted by rotation of the blastocyst, similar to that known to occur in human embryos preceding implantation.

This led to a discussion of interplay between dimensions, and questions about alternating stages of image reversal in various sorts of mirrors: planar, concave, convex.

Somehow Piaget got mentioned and Bateson voiced the opinion that he was "not very bright". No one disagreed.

After another hour or so the discussion wound down with Francis Huxley asking Bateson whether he had met Carlos Castaneda. Bateson answered that he hadn't, but that he had read his books.

What did he think of them?

"Imagine!" he burst into laughter at the idea. "Hallucinating a Spanish-speaking coyote!"

Then he added, "There's only one thing left for Don Juan to tell Carlos."

A long pause.

"There is no contingency pattern."

(1) G. Bateson, *Orders of Change,* Part 1, Naropa Institute, Boulder, Colorado, 1976 (recorded in August 1975).

(2) J. Brockman, ed., *About Bateson,* E.P. Dutton, New York, 1977, p. 245.

(3) M. Heidegger, *The Basic Problems of Phenomenology,* translated by A. Hofstadter, Indiana University Press, Bloomington, 1982, p. 297.

(4) H. Maturana and F. Varela, *Autopoiesis and Cognition,* D. Reidel, Dordrecht, 1980.

Annual Gregory Bateson Lecture Established In Philadelphia

The Philadelphia Society for Adolescent Psychiatry recently announced the First Annual Gregory Bateson Lecture, scheduled for Tuesday, October 1st. Dr. Heinz von Foerster will be the speaker; "On Seeing: The Problem of the Double Blind" is the topic.

For additional information, contact Mrs. Mary Staples, PSAP Secretary, (215)566-1054. Advance registration is necessary.

Correspondents Wanted

On logical categories of learning and/or formal models of mind: Steve Kemp, 1507 E. Franklin St., No. 128, Chapel Hill, NC 27514.

On the Arts as contextual processes, deriving and encoding meaning in particular environments: Mark Siegeltuch, 20 Dongan Place, New York, NY 10040.

Gaia Poem

By Neill Kramer, 74 Arvine Heights, Rochester, NY 14611. Copyright 1985 by Neill Kramer.

Nature red in tooth and claw?
Or is intelligence something more?

Genes, genes
the gene machines
What paradigm can be more obscene?

Evolution's driving force?
It's a learning of sorts

Humans seem to probe and probe
Is it the same for the anaerobes?

one medium-sized planet
orbiting a star
life a mystery
here and far

       webs and webs
       of relational beings
       learning this trade
       survival it seems
       but on the way
       to the next generation
       minds are at work
       organisms salvation

(Editor's note: This poem was written after Neill's participation in the Symposium "Is the Earth a Living Organism?", held at Amherst, Massachusetts, in early August. At the Symposium, Neill presented a paper entitled "Neither Mechanical Nor Supernatural: Steps to Understanding Living Systems", which summarizes Bateson's theory of mental process. The paper ends as follows:

Bateson says that "... mind is capable of purpose and choice by way of its self-corrective possibilities." Mind is capable of steady state or runaway and is influenced by maps, never by territory. It is also limited in that its receipt of information will never *prove* anything about the world or about itself. But the system will learn and remember, it will build negentropy, and "... it will do so by the playing of stochastic games called *empiricism* or *trial and error.*" Its maps will be characterized by logical typing, and thus it will be capable of error. Finally, the system is capable of uniting with other systems to make still larger wholes.

Here we have a setting of criteria by which we can determine whether a system has mind or not. As to the question of whether Gaia, or the entire Earth, is "alive", my inclination is to say that Gaia possesses mind. To say that a child, who has mind, when playing with a toy involves the toy in that circular process of "difference-making", we allow inanimate objects to partake in mental phenomena. Thus, the life on Earth, in its interactions with non-living systems, does not exclude such systems from having mind. The entire system, "life-plus-environment" manifests the necessary criteria for mind...

And, in a letter dated August 26, 1985, Neill writes:

Bateson felt that the communication involved in religious practices is an attempt to get back to pure mood signs, a mixing of map and territory along with primary process thinking. Toward the end of his life he may have felt that deep aesthetic experience might in some way be religious, and his feeling that the ocean is alive might also be religious. My own feeling is that religious experience is a move in the direction of the oneness that is the glue which holds together all of life. It is perhaps primal in the sense that rationality can't reach it. Religions, on the other hand, try to formalize what is best left unsaid. What is important is to establish the importance of the sacred in some context that the modern sensibility doesn't feel alienated. Perhaps the Gaia concept is a step, along with mind as immanent in Gaia.

Neill would appreciate responses to these ideas, either directly in correspondence with him, or through *Continuing the Conversation.)*

Bateson Studies in Japan

A Japanese scholarly journal has devoted much of a recent issue to Bateson-related articles. Rough translations of the article titles have been provided by Dr. Tyrone Cashman (3428 Fremont Ave. S., Minneapolis, MN 55408):

From 現代思想 *(Journal of Contemporary Thought)* 12(5), May 1984, published in Tokyo.

"This Delightful Academic Science", interview with Yujiro Nakamura, pp. 54-61.

"Hunter of Relationships", Yoichiro Murakami, pp. 62-65.

"Adventurer of Mind", Kimiyoshi Yura, pp. 66-68. "Lessons of Bateson", Yoshiaki Sato, pp. 140-149. "A Trace of Bateson", Toshihiko Hasegawa, pp. 150-159.

"Avantgarde of *Journal of Human Races"*, Keizo Miyasaka, pp. 69-91.

"Copy and Strength", Seiichi Hanamura, pp. 92-103. "R.D. Laing and Bateson", Haruhiko Shiki, pp. 138-139.

"Double Bind and Three Levels of Value (Learning?)", Katsuyuki Nagaoka, pp. 160-177.

"Systems-Cybernetics Approach", Keizo Sato, pp. 120-126.

"Double Bind", A. Wilden, translated by Shizuya Okazawa, pp. 103-119.

"Zen and Double Bind", Satoko Akiyama, pp. 127-137. "Passion (Enthusiasm?) for Double Bind", Yasuo Kobayashi, pp. 178-187.

"Theory of Epistemology", Akira Unami, pp. 188-195.

"Pathologies of Epistemology", G. Bateson (from

Steps to an Ecology of Mind), translated by Shizuo Satoma, pp. 196-207.

"Theory of Play and Fantasy", G. Bateson (from *Steps to an Ecology of Mind),* translated by Yasaki Saeki, pp. 208-223.

Are there any readers willing to take on the job of translating any or all of these articles (and possibly other articles as well)? If so, please contact Dr. Cashman for copies of the articles, or write to our "Japanese connection", Dr. Toshihiko Hasegawa, Department of Surgery, The Shiga University of Medical Science, Seta Tsukiwa-cho, Otsu-shi, Shiga 520-21, JAPAN, for details on Japanese interest in Bateson's ideas.

Continuing the Conversation in New York City

Paul Ryan (536 Bloomfield St., Hoboken, NJ 07030) has sent a list of happenings at the Cathedral of St. John the Divine, 1047 Amsterdam Ave., New York, NY 10025, where "Bateson themes are taken seriously in the Continuing Conversations on the Gaia hypothesis".

Paul, Frank Gillette, .and Lucy Lippard held a three-way symposium and discussion on "Art & Ecology: An Appreciation of the Work of Gregory Bateson" last May at the Cathedral. (Please contact Paul if you know of tapes made of part or all of this event!)

Upcoming events:

Sunday, October 20th: Holy Communion and Sermon, 11:00 am. "Prospects for a Family of Nations in the Context of Apartheid—A Hard Look at the Future on the 40th Anniversary of the United Nations", by Dr. Mary Catherine Bateson.

Saturday, November 2nd: Gaia Institute Lecture, 10:00 am – 12:00 pm. From Cultural History to Cultural Ecology", by Dr. William Irwin Thompson.

Saturday, November 9th: Gaia Institute Lecture, 10:00 am – 12:00 pm. "Rethinking Animism in Myth and Science", by Dr. William Irwin Thompson.

Saturday, November 23rd: Gaia Institute Lecture, 10:00 am – 12:00 pm. "Gaia Politique", by Dr. William Irwin Thompson.

Saturday, November 30th: Gaia Institute Lecture, 10:00 am – 12:00 pm. "The Apocalyptic Imagination and the Ending of Worlds", by Dr. William Irwin Thompson.

(Note: Each of Dr. Thompson's lectures will be followed by a discussion session, 1:30 – 3:00 pm. Tickets for each lecture are $ 5.)

Saturday and Sunday, November 23rd and 24th: Gaia Institute Conference, 10:00 am – 5:00 pm Saturday, 11:00 am 4:00 pm Sunday. "The Ethical and Environmental Implications of the Gaia Hypothesis", including Mary Catherine Bateson, James Lovelock, Lynn Margulis, James Parks Morton, Maurice Strong, William Irwin Thompson, John Todd, and Nancy Jack Todd. Discussion in afternoons; tickets are $ 20 for both days.

For additional information, call Jocelyn Kress Turner, 212-678-6732.

…and an Open Question

From Paul Ryan:

"When do Bateson's ideas, *without* the Bateson label, legitimately make their way into the ecology of mind? Gaia discourse? Family therapy?"

Perusing The Periodicals

A survey of the *Science, Social Sciences,* and *Arts and Humanities Citation Indexes* (January – March 1985) for significant articles referring to the ideas of Gregory Bateson resulted in the following "finds", of more than just specialist interest:

Robert J. Branham and W. Barnett Pearce, "Between Text and Context: Toward a Rhetoric of Contextual Reconstruction", *Quarterly Journal of Speech* 71(1), February 1985, 19-36. A very suggestive attempt to explore the relations between the Represented and its Representation (or lack of it!). Paradoxes and oscillations as due to feedback processes of peculiar sorts from context to text and back again: "strange loops". Mystical notions as embedded in "subversive loops". Suggested ways to deal with peculiar text/context loops: make the texts conform to their contexts; shut up; destroy the context; or reconstruct the context. The Medium being remade by the Message...

Paul Delany, "'We Shall Know Each Other Now': Message and Code in D.H. Lawrence's 'The Blind Man'", *Contemporary Literature* 26(1), Spring 1985, 26-39. Delany tries to "formalize the contradictions of Laurentian dogma in the terms of modern communication theory", the dogma being a strict division of "mental-consciousness" from "(flesh-and-)blood-consciousness". Lawrence strived for a unity of these consciousnesses, but failed, according to Delany, because they are fundamentally different kinds of communication systems, the former "digital" and the latter "analog".

Norman K. Denzin, "Toward a Phenomenology of Domestic, Family Violence", *American Journal of Sociology* 90 (3), November 1984, 483-513. Bateson's ideas about "schismogenesis" are central to Denzin's theory of unstable, violent families: "...schismogenesis... locks the family of violence in a circuit of violent selfness that attaches and connects each subject to a web of violence that is chainlike in its grip."

Sophie Freud Loewenstein, "Freud's Metapsychology Revisited", *Social Casework* 66(3), March 1985, 139-151. Loewenstein claims Freud as "the first communication theorist", since Freud considered all behavior as communicative.

Donald Tuzin, "Miraculous Voices: The Auditory Experience of Numinous Objects", *Current Anthropology* 25(5), December 1984, 579-596. Is the "still small voice" directly related to the effects of low frequency sounds? In this controversial paper, Tuzin argues for a connection between infrasonic noise (made by distant thunder, for example) and religious feelings—with the temporal lobe mediating between the two. If he's right, isolation tanks will no doubt be replaced by rumble rooms.

Help Needed from Southwestern Anthropologists

Among the papers of Gregory Bateson in the Margaret Mead Collection at the Library of Congress is a photocopy of a transcription of a talk given by Bateson at a meeting of the Southwestern Anthropological Association. The transcription, entitled "Anthropology and Systems", was published in the *Newsletter* of the SWAA, ca. 1972 or 1973, but archivists have been unable to determine the full correct citation. If you have back issues of the SWAA *Newsletter,* or know where they can be found, please contact Rodney Donaldson, P.O. Box 957, Ben Lomond, CA 95005, or Greg Williams at *Continuing the Conversation.* Thanks!

Bateson's Books Reviewed – Part 1

Included below are reviews of books by and about Gregory Bateson which have been seen by the Editor of Con*tinuing the Conversation.* Readers are urged to send information on reviews not listed (especially reviews appearing in the foreign press).

Balinese Character (1942; with Margaret Mead):
  Bulletin of the History of Medicine 13, 1943, 691.
  Pacific Affairs 16, 1943, 501.
  Rural Sociology 8, 1943, 307.

Naven (1936):
  American Journal of Psychology 51, 1938, 181.
  American Journal of Sociology 43, 1937, 172.
  American Sociological Review 2, 1937, 567.
  Boston Transcript, January 30, 1937, 2. Nature 139, 1937, 454.
  New Statesman & Nation 13, June 9, 1937, 50.
  Spectator 158, 1937, 414.
  Times Literary Supplement, February 27, 1937, 145.
  Isis 27, 1937, 354.
  Oceania 8, 1937-1938, 373.

Naven (1958; second edition):
  American Sociological Review 23, 1958, 609.
  Scientific American 214, June 1966, 143.
  Social Forces 37, 1959, 374.

Communication (1951; with Jurgen Ruesch):
  Annals of the American Academy of Political and Social Science
      278, November 1951, 220.
  Public Opinion Quarterly 16, 1952, 133.
  Time 58, October 8, 1951, 78.
  United-States Quarterly Book Review 7, 1951, 299.

Perceval's Narrative (1961):
  American Anthropologist 64, 1962, 907.
  Bulletin of the History of Medicine 37, 1963, 89. Library Journal
      86, 1961, 4194.
  New Statesman 64, 1962, 205.

(to be continued in the next issue)

Editor's Choice

(One or two selections from the published works of Gregory Bateson will be listed in each issue, to promote their wider appreciation. Emphasis will be on lesser-known papers.)

For a succinct response to sociobiologists, see Bateson's letter of February 21, 1980, to Anthony Leeds, in Anthony Leeds and Valentine Dusek, "Sociobiology: A Paradigm's Unnatural Selection through Science, Philosophy, and Ideology", *The Philosophical Forum* 13(2-3), Winter-Spring 1981-82, xxix-xxx.

And one of the most detailed examinations of Bateson's ideas on the workings of the "nervous system" is: Gregory Bateson and Robert W. Rieber, "Mind and Body: A Dialogue", in Robert W. Rieber, editor, *Body and Mind: Past, Present, and Future,* Academic Press, New York, 1980, pp. 241-252.

Call for Contributors

Continuing the Conversation needs *your* inputs! Send comments, short papers, book reviews, research reports, details on upcoming events, suggestions, queries, anecdotes, riddles, and whatever else you can find or think of... All contributions received will be considered for publication unless otherwise requested. Copyrights are retained by authors. *Deadline for the next issue is December 1, 1985.*

Explanation of Address Codes

Above your address is a "C", or an "S", or a number (i.e., "3").

A "C" means that you have received this issue with our compliments, and that you will *probably* continue to receive the newsletter free. Lucky you! Still, you might want to subscribe just to be sure...

An "S" means that this is the last free sample (and maybe the first, also) that you'll receive. Please subscribe! (Semi-lucky you...)

A number means which issue is last on your subscription (this is issue 2; the Winter issue is 3; etc.).

Continuing the Conversation

A Newsletter on the Ideas of Gregory Bateson

WINTER 1985 — Editor, Gregory Williams — **NUMBER 3**

The Conversation Continues…

As the subscription list for *Continuing the Conversation* approaches 100 names, it is beginning to look like this newsletter is filling a real need of many Bateson enthusiasts. More importantly, reader participation in the "conversation" is growing rapidly. This issue is being sent to about 300 individuals and institutions thought to be interested in the ideas of Gregory Bateson, including many members of the American Society for Cybernetics and faculty members of several college communication departments.

Continuing the Conversation needs inputs from as many readers as possible to become a *multivoiced "metalogue"*—please share your ideas, information, and responses to articles published herein. Thanks!

Words to Gregory Bateson

By Philip Stewart, Forestry Institute, South Parks Rd., Oxford OX1 3RB, UNITED KINGDOM. Copyright 1985 by Philip Stewart.

Oh Gregory you old sham, how you would be laughing now, if you still had a body to laugh with! You chain-smoked your way to cancer and emphysema, you ruined your magnificent body with long journeys and late nights, and now your name is a by-word for wisdom.

Perhaps it is because it did not come naturally to you that your struggle towards wisdom has so impressed. The Taoist sage says nothing, and so there is nothing to talk about; but you, Gregory, have left us so many words that it will take us years just to collect them all together.

And there are such long words, such tortuous sentences. You need not have avoided simple language. It is almost as though you had thought that difficult truths need difficult statement. Perhaps the trouble is that you spent most of your time talking to intellectuals -not enough time with children!

Ah yes, children! They were your blind spot. I shall never forget the time that I brought my three-year-old son Gregory—named after you—to say hello to you in your hotel in London in 1979. His grandma had just given him a plastic crocodile which could open and close its jaws. He wanted to show you that it could bite your finger, but you pulled your hand up out of his reach, sipped your martini, and went on talking about grown-up abstractions.

It amazed me to discover that the man who opened his *Steps to an Ecology of Mind* with the metalogues—conversations with his young daughter—was incapable of talking to children. Perhaps the trouble was that Mary Catherine was so precocious that you were able to talk to her at an early age the same way you talked to adults.

Oh dear, those metalogues! On that same occasion I asked you whether you had read Douglas Hofstadter's *Gödel, Escher, Bach.* You said, "A clever young man who has got hold of a good idea and worked it to death!" In fact you put me off reading it for a long time. Perhaps you could not forgive him for writing metalogues better than yours.

Or was it that you were upset because he had publicized the fact that Bertrand Russell's Theory of Logical Types had been blown sky-high in 1931, before you had even begun quoting it in a whole series of publications? There was no need to be offended: you were not the only person who had not read Gödel. On the contrary, the world has only begun to work out the effects of his discovery.

In any case, you may as well admit that you did not take Bertrand Russell very seriously. You wrote to me in 1975: "... stop quoting un-fashionable authors like Bateson in your research proposals... I usually use Freud and Bertrand Russell, with a little Whitehead thrown in, but the last-named is really not a journalist and his name somewhat frightens the birds."

Forgive me for bringing all this up now, but none of it has stopped me from talking to you although you no longer have ears to hear. So much of what you said was new and important, and I want to wrestle it out into a form that ordinary people can approach.

Take your book *Mind and Nature* for example. When you talked about it I thought, "Oh good, now at last he is re-stating himself simply." And yet in the first paragraph you say: "Even grown-up persons with children of their own cannot give a reasonable account of concepts such as entropy, sacrament, syntax, number, quantity, pattern, linear relation, name, class, relevance, energy, redundancy..." I will not embarrass you by going on, but you throw 27 such terms at the reader all in one dreadful sentence. How many people do you expect to get beyond that?

If your ideas are ever to be fare for more than a small intellectual minority, you will have to do better. And so it is that for years now I have been struggling to translate you into plain English. And the only way I can progress is by putting things to you in the ear of my imagination and trying to hear how you would reply.

What a pity it has to be this way! If only you had lived wisely you should still be with us. But then perhaps you would have fallen into a Taoist silence. What must be must be.

Steps to a New Consciousness

By James McNeley, 18102 County Rd. G, Cortez, CO 81321. Presented at the Revisioning New Mexico Conference held in Albuquerque, November 1985. Copyright 1985 by James McNeley.

The problem, as I see it, is best stated by Stephen Nachmanovitch in an article about Gregory Bateson in the Fall 1982 issue of *CoEvolution Quarterly:*

We know it is quite possible for this world to be destroyed before our children can grow up. We think at once of nuclear war, but that is only the leading edge of a many-sided emergency in which human damage to the Earth is beginning to come back on us.

The danger is not ultimately resolvable on the level of weapons, nationalisms, destruction of animal and plant habitats, of soil, air, water, cities. These individual symptoms all interlock to form a very big runaway system which is the enactment of our own presuppositions, underlying habits of thought deeply embedded in our everyday life as what we call "common sense". Our whole way of thinking and seeing has got to he renovated from the inside out.

It is a crisis of mind. It's a case of wake up or die. (1)

If Nachmanovitch is right, all of the aforementioned problems as well as ones of more immediate concern today are connected in a system resulting essentially from our way of thinking about the world. We might well ask, paraphrasing a well-known phrase by Gregory Bateson:

> What pattern connects the national power grid to developmental capital and patriarchal society to the Contras and all four of them to me? And me to you? And all the six of us to the crisis in the cities in one direction and the nuclear arms predicament in another? (2)

And if we were astute as Bateson we would discover the connecting patterns; and, furthermore, that all of these concerns are connected in part through pathways in the external world but, more importantly, they are connected in pathways through our own consciousness. This gives us a point of attack—a point where this whole interlocking, crazy, runaway system is vulnerable. Once we understand the role of our own thinking in keeping this system on a runaway course, we achieve a certain power over it. We can make a critical difference in our thinking—one which, in Bateson's words, "makes a difference" elsewhere—that is, which impacts upon the whole system.

How can we bring about this critical difference in our thinking? To adapt another Bateson concept, we need to build an "ecology" for—the conditions for supporting—a new state of mind. Someone facetiously suggested that New Mexico should secede from the Union. While we cannot do that, we could issue something like a Declaration of Mental Independence. We would then need to develop a Constitution enunciating the principles of our new State of Mind—and an ecology, infrastructure, and institutional base capable of supporting it.

Allow me to visualize how an ecology for the new New Mexican State of Mind might look:

1. It would provide means for engaging in genuine dialogue with the Native American and Hispanic sectors of New Mexican society, perhaps through a series of Intercultural Forums or Seminars. This would help us learn more about the mental biases of the high-tech sector of our society as well as learning alternative ways of relating to the natural environment.

2. Local bioregional councils could provide support at the community level for philosophies and values which are conducive to developing sustainable economic alternatives that are rooted in local resources and human skills.

3. We would need to build defenses of our New State of Mind against the internal and external forces which would undermine it. Besides linkages with friendly states of mind elsewhere, we are provided in New Mexico with a unique opportunity for something like guerrilla mental warfare against the old state of mind. After all, New Mexico contains within its borders key elements of the national nuclear armaments industry—the Los Alamos Laboratory, the Trinity Site at White Sands, the uranium mines on our Indian reservations, the nuclear stockpiles under the Manzano Mountains, etc.—powerful symbols of the nuclear age which can be invoked in public actions to bring about changes in the old way of thinking.

4. We should develop the social means—such as a Research and Information Center—for helping individuals to discover unknown connections between their actions as consumers and the fate of distant elements of the biosphere. Essentially, such a Center would help individuals to think systemically and holistically in their everyday decision-making.

There are, then, steps which we can take toward developing a new consciousness. But due to the imminent danger of destroying ourselves, we need to learn to take big steps—and we need to walk fast!

(1) S. Nachmanovitch, "Old Men Ought to be Explorers", *CoEvolution Quarterly* (35), Fall 1982, p. 34.

(2) Bateson's original reads: "What pattern connects the crab to the lobster and the orchid to the primrose and all the four of them to me? And all the six of us to the amoeba in one direction and to the back-ward schizophrenic in another?" (G. Bateson, *Mind and Nature: A Necessary Unity,* E.P. Dutton, New York, 1979, p. 8.)

Addendum: A Story and a Preliminary Call for Papers

A young man returned home to the Navajo Indian Reservation and visited with his grandfather.

"Grandfather, did you know that White Men send their children for 13 years to big buildings where their elders teach them all kinds of things and they read books written by other elders?

"And, Grandfather, did you know that after that many of those children go to places where they have lots of even bigger buildings and for four more years they read and think and talk about many different things?

"And—did you know Grandfather?—that some of them then go on to other, bigger places where they have even more books than the Navajo have sheep, and they sit with the wisest of their elders, and think and talk and sift the earth through their fingers and study the stars.

And, Grandfather!—did you know that some of them then spend the rest of their lives in these buildings filled full of books, and thinking and talking with others, and they are even given money for doing these things. And, do you know what they have discovered? They have discovered that everything is interrelated!"

The old man sat quietly for a minute, reflecting upon what he had been told, then he replied, "I wondered when they would finally discover that!"

I am soliciting ideas for, or abstracts of, papers for possible presentation at a symposium on the interfaces or connections between Native American religious thought and Batesonian holistic science. The symposium will be conducted as a part of the 1986-87 Conference on American Indian Religions to be held at the University of California, Santa Barbara. Contributions which address either the Native American or the holistic science perspective—or, ideally, both!—on issues of mutual interest and concern are welcome. Send your ideas or abstracts to: James McNeley, Dean of Instruction, Navajo Community College, P.O. Box 580, Shiprock, NM 87420.

Gregory Bateson and the Map—Territory Relationship

By David Shiner, 322 N. County, Apt. 1, Waukegan, IL 60085.

For a great thinker, the attraction of a large number of disciples and appreciators must always be a mixed blessing. On the positive side, there is the gratification of having earned a good deal of respect. There is however also a negative side. This includes the seemingly inevitable proliferation of interpretations of the master's work, many of which vary significantly from the intentions of their originator. For various reasons, this problem is particularly acute in the present age; there is no recognized thinker of this century whose work is completely free of it.

Scholarship on the work of Gregory Bateson is showing marked signs of manifesting this problem of varied interpretations. The difficulty in this case is exacerbated by the fact that scholars often do not distinguish clearly between those aspects of their work which straightforwardly follow Bateson's and those

which attempt to move in other directions. This was evident in the Bateson Symposium at the College of St. Benedict this past May. During this event several scholars presented views which, while extremely interesting in themselves, differ from Bateson's in significant respects.

One such divergence concerns what Immanuel Kant called *ding an sich,* the "thing in itself". Can such "things" be actually said to exist, or are they merely the product of a false epistemology? This question is taken up by Bateson in much of his later writing, and was also addressed at the Bateson Symposium by Dr. Humberto Maturana. In his account of scientific method, Maturana emphasized the lack of any necessity for the assumption of *ding an sich* in rendering intelligible the full domain of human experience. After citing Korzybski 's epigram, "The map is not the territory", Maturana quoted with approval Heinz Von Foerster's amendment, The map is the territory." This view—that properly speaking we cannot assert the existence of territory apart from our maps—was also espoused by Dr. Ernst Von Glasersfeld in his closing address at the Symposium.

Consideration of such major issues in metaphysics and ontology is of course interesting in itself. My concern here, however, is much more limited: namely, the examination of whether the view of Maturana and company on this issue is in fact that held by Bateson himself. On this issue, the written evidence shall serve as our guide.

Bateson's initial public exploration of the "map-territory" relationship was rendered in his lecture "Form, Substance, and Difference" (1). After citing and espousing Korzybski 's dictum that the map is not the territory", he claims that "the territory does not get onto the map". Rather, he goes on to assert, "differences are the things that get onto a map". "Difference" is "an abstract matter" rather than *ding an sich,* but it is still dependent on ontological assumptions: "Difference travels from the wood and paper into my retina"

Now Bateson does not quite mean this last statement literally. On his account, difference cannot really "travel from" things; it cannot be localized that concretely. "Obviously", Bateson says, "the difference between the paper and the wood is not in the paper; it is obviously not in the wood..." It is rather the case that we construct our maps by means of difference and that every map is based upon a coding of those differences which we deem relevant. Such differences are ultimately grounded by the notion of territory, or *ding an sich.*

Bateson regularly indicates that the mapping process entails the existence of territory. Early in *Mind and Nature,* for example, he writes that "in all thought or perception or communication about perception, there is a transformation, a coding, between the report and the thing reported, the *ding an sich"* (2). This sort of language, implying acceptance of the existence of "the thing reported" even if it can never be known in itself, dominates Bateson's later writings. Thus the inner meaning of his assertion in *Steps* that "'data' are not events or objects but always records or descriptions or memories of events or objects" (3) is not that events and objects do not exist, but rather that the manner in which they exist is not determinable by any finite perceiving entity.

This belief in the perspectival character of knowledge is fundamental to Bateson's position; it does not, however, entail the denial of *ding an sich.*

Further examination of Bateson's works reinforces this understanding of his position. Although he is not particularly interested in discussing the existence of *ding an sich* ("We wander off into philosophy if we ask, 'Is there a territory?'", he writes in the "Afterword" to *About Bateson* (4)), his writings generally tend to entail a belief in its existence. The following is instructive on this point.

I have use of the information that that which I see, the images, or that which I feel as pain, the prick of a pin, or the ache of a tired muscle.., that all this is neither objective truth nor is it hallucination. There is a combining or marriage between an objectivity that is *passive* to the outside world and a creative subjectivity, neither pure solipsism nor its opposite.

Consider for a moment the phrase, *the opposite of solipsism.* In solipsism, you are ultimately isolated and alone, isolated by the premise "I make it all up". But at the other extreme, the opposite of solipsism, you would cease to exist, becoming nothing but a metaphoric feather blown by the winds of external "reality"... Somewhere between these two is a region where you are partly blown by the winds of reality and partly an artist creating a composite out of the inner and outer events. (5)

This passage, like most of those on this subject, presumes a "reality" of the sort for which Kant coined the term *ding an sich.* One could not reasonably interpret such words in any other manner.

Those who would read Bateson as either denying or suspending belief in *ding an sich* follow a line of thought to which certain of his writings give unfortunate credence. For example, Bateson says in "Form, Substance, and Difference" that a paper map "is a representation of what was in the retinal representation of the man who made the map; and as you push the question back, what you find is an infinite regress, an infinite series of maps. The territory never gets in at all" (6). This passage is consistent with the view implicit in Von Foerster's aphorism only if one thoroughly denies any credence to the aforementioned "Difference travels from the wood and paper into my retina". Such an interpretation is inappropriate to Bateson's general position. The fact that "the territory never gets in at all" or, as Bateson says elsewhere, "the territory is *ding an sich* and you can't do anything with i t" does not imply that "territory" can be altogether dispensed with. Since in fact Bateson does not dispense with i t, it remains for us to provide an account of its actual function in his scheme.

Examination of the function of "territory", of *ding an sich,* inevitably takes us back to the originator of the concept, Kant. Here we come to realize that this entire facet of Bateson interpretation is an echo of a philosophical debate of nearly two centuries ago. Many aspects of Bateson's position may be characterized as modern-day Kantianism, while the interpretations (if they are in fact interpretations) put forth by Maturana, et al., bear striking resemblance to the reconstructions of Kant by the German Idealists of the early nineteenth century.

For our purposes, the most important similarity between Kant and Bateson concerns the similarity of their views with respect to *ding an sich.* Kant reprimanded the philosophers and scientists of his day for centering their study on the *ding an sich,* arguing instead that mind should be at the center of the study and that all percepts must be conceived as fundamentally bound to mind. Kant, like Bateson, claimed that the actual source of our percepts can never be known in itself. Kant thus focused attention on what Bateson was to call "maps"; that is, those percepts as they are organized and coded by mental processes. These maps, this "reality as we know it", Kant labelled "phenomena". Our understanding pertains only to this realm; it can make no valid claims about the nature of *ding an sich,* or "territory", which Kant labelled "noumena".

Although we can make no claims about the nature of noumena, Kant believed we can still assert its existence. In the *Critique of Pure Reason,* he wrote that such an assertion

is necessary, to prevent sensible intuition from being extended to things in themselves and thus to limit the objective validity of sensible knowledge. The remaining things, to which it does not apply, are entitled noumena, in order to show that this knowledge cannot extend its domain over

everything which the understanding thinks... we have no intuition... through which objects outside the field of sensibility can be given, and through which the understanding can be employed *assertorically* beyond that field. The concept of a noumenon is thus a merely *limiting concept* /Grenzbegriff/, the function of which is to curb the pretensions of sensibility; and it is therefore only of negative employment. At the same time it is no arbitrary invention; it is bound up with the limitation of sensibility, though it cannot affirm anything positive beyond the field of sensibility. (7)

This account coheres nicely with Bateson's. The lack of understanding of the nature of *ding an sich* is to be accepted as unavoidable; however, the denial or suspension of belief in its existence is inappropriate. For Bateson as well as Kant, the conception of "territory" is an inseparable correlate of the idea of "map". The "map", like Kant's "phenomenon", is that which appears to us and which we help to create; "territory" or "noumenon" represents the idea of the "thing" apart from its appearance -thus, "thing-in-itself". We do not perceive this "thing-in-itself", but the very conception of it necessarily accompanies our idea of the part or parts which we do perceive.

We are not, of course, committed to this view. However, the writings of both authors indicate the perils in rejecting it. If we do not accept this "limiting conception", if we deny what Bateson terms "the winds of reality", we become radical subjectivists and epistemological relativists—a position which both Kant and Bateson took great pains to avoid.

Kant's successors were inclined to read his works in a manner congenial to their own views. Certain idealistic phrasings in Kant's posthumously-published *Opus Postumum,* for example, were interpreted by some to indicate that the author had ultimately abandoned the doctrine of the existence of *ding an sich.* According to this way of thinking, the dying Kant finally realized the true implications of his work, which his successors then helped to unfold. This view is just as incorrect as would be a similar claim concerning Bateson. Certainly the thoughts of both men continued to undergo change until their respective deaths; however, the belief that this change was manifested in the eventual denial of the existence of *ding an sich* is quite clearly contradicted by the writings of both men.

There is, I believe, a lesson to be learned here. As followers and appreciators of Gregory Bateson, we should be grateful to those who have worked to give his views a broad hearing. We should not allow such gratitude to blind us to the actual content of their claims. If Maturana, Von Glasersfeld, et al., are merely working on what the Bateson Symposium in Minnesota termed "the questions of Gregory Bateson", then their work merits a good deal of praise. However, if they are claiming that their answers to these questions are identical to those proposed by Bateson, they need to reconsider whether the maps they are drawing bear sufficient resemblance to the territory they are exploring.

(1) G. Bateson, Steps to an Ecology of Mind, Ballantine Books, New York, 1972, pp. 448-465.

(2) G. Bateson, Mind and Nature: A Necessary Unity, E.P. Dutton, New York, 1979, p. 30.

(3) G. Bateson, Steps to an Ecology of Mind, Ballantine Books, New York, 1972, p. xviii.

(4) G. Bateson, "After word", in J. Brockman, editor, About Bateson, E.P. Dutton, New York, 1977, p. 239.

(5) Ibid., p. 245.

(6) G. Bateson, Steps to an Ecology of Mind, Ballantine Books, New York, 1972, p. 454.

(7) I. Kant, Critique of Pure Reason, translated by N.K. Smith, Macmillan, London, 1933, p. 272.

(Editor's note: The cluster of philosophical issues surrounding recent thinking in epistemology appear to be highly controversial. Stances approximating, or at least related to, "radical constructivism" have been taken by several thinkers working in the tradition of Gregory Bateson. Perhaps *Continuing the Conversation* could serve as one forum for contemporary debates on epistemology (and of course, almost inevitably, on metaphysics). To start the process, copies of Dr. Shiner's paper are being sent to individuals known to be interested in the issues he has discussed; replies will be directed to Dr. Shiner and then printed, with his rejoinder, in a future issue of *Continuing the Conversation.* Comments and critiques regarding Dr. Shiner's paper are welcomed from *any* reader; these will be forwarded to Dr. Shiner for publication with his rejoinder as space allows.)

"Conversations in Cybernetics" Meeting

The next annual meeting of the American Society for Cybernetics is scheduled for February 19-23, 1986, at Virginia Beach, Virginia. This meeting replaces the two originally scheduled for Fall 1985, in Montreal, and June 1986, in Vancouver.

For more information, contact Dr. Laurence D. Richards, Engineering Management Program, Old Dominion University, Norfolk, VA 23508; telephone (804)440-3758.

Zeitschrift für Systemische Therapie

This West German journal includes many articles of interest to Bateson appreciators, whether they are involved with psychotherapy or not. "Systemic therapy" is construed very broadly by the editor of *ZST* to include social processes at all levels—for example, the arms race. In German with brief English abstracts.

Price for a one-year subscription is DM 48; send to: Verlag Modernes Lernen-Dortmund, Hohe Str. 39, D-4600 Dortmund l, FEDERAL REPUBLIC OF GERMANY. Editorial correspondence and manuscripts should be sent to Jürgen Hargens, Norderweg 14, D-2391 Meyn, FEDERAL REPUBLIC OF GERMANY.

About Gregory Bateson, Recently

William Irwin Thompson, "With Gregory's Mind in Nature", *Annals of Earth* 3(2), 1985, 4-6. A remarkable reminiscence of Bateson's days at Lindisfarne in the Seventies, and also an incisive commentary on the sources and directions of "frontier thinking" among "planetary culturists". Thompson honors Bateson's memory by probing some of the apparent contradictions and hesitancies in his ideas. For Gregory's generation the shadow of his parents, and the shadows of the cultural grandparents of Darwin, Marx, and Freud, demanded a turning around in California to face toward Europe. But for people of my generation there can be no going back... Precisely because Gregory was not a Professor of Mathematics or Philosophy, he was free to be original, but constrained also to reinvent the wheel, mainly because he refused to read very much. He did not know the basic literature of Western Philosophy, and he never rushed about, trying to keep up with all the disciplines that were moving so fast around him. He was a genius, but he was a slow thinker, and his mind moved like a tectonic plate; but once it had moved, the whole landscape was transformed." *Annals of Earth* is available for an annual contribution of $ 10 or more, tax deductible in the U.S., to either Ocean Arks International or the Lindisfarne Association, Inc. (Foreign: International Money Order or U.S. dollar check.) All contributions should be sent to: Annals of Earth, 10 Shanks Pond Rd., Falmouth. MA 02540.

Rhoda Gilman, "The Upsetting Ideas of Gregory Bateson", *North Country Anvil* (50), September 1985, 32-34. A report on the Bateson Symposium in Minnesota last May, including a capsule summary of Gregory's life and ideas. "Ty Cashman tells the story of how he once asked: 'Bateson, what are you really up to?' The

✱ wry answer was: 'I'm trying to make sure that of the thousand who survive, twenty will know how to think.'" Also quotes briefly from Mary Catherine Bateson's keynote address. Sample copies of *North Country Anvil* are $ 2 each, from NCA, Box 37, Millville, MN 55957.

Readers are invited to send information on any discussions (or even just mentions!) of Gregory Bateson's notions "hiding" in obscure publications, old or new. Thank you.

Work in Progress

Neil F. Ravella (6428 Rutgers, Houston, TX 77005) is writing a dissertation about the issue of "power" in psychotherapy, and he welcomes correspondence with others on this topic.

Lynnwood Brown (P.O. Box 1099, San Juan Pueblo, NM 87566), tribal planner in a Pueblo community, is interested in corresponding with readers interested in "sacred space".

Jonathan G. Andelson (Department of Anthropology, Grinnell College, Grinnell, IA 50112) writes:

> I am an anthropologist, a student of Roy Rappaport's at the University of Michigan in the early 70's, about the time Roy was getting involved with Bateson... My own use of Batesonian concepts began in my dissertation on the Amana Colonies, a separatist, sectarian community in Iowa since 1855. The origins of the group go back to Germany in the year 1714, and the group lived for a time near Buffalo, New York, in the 1840's and 1850's. For 89 years, the Amana people lived communally, holding all of their property in common, and my dissertation focused on the "Great Change" which took place in Amana in 1932, when the members elected to abandon communalism in favor of a private joint-stock corporate form of organization. I made Bateson's "double-bind" the centerpiece of my analysis of the reasons behind Amana's reorganization, arguing that the structures which the colonists had set up for themselves began to put them in a group double-bind, presenting them with irresolvable combinations of injunctions. I would be interested to know if any of your readers have made use of double-bind theory in a social setting.

More recently, I have been at work on a comparative study of the ways in which utopian or communitarian groups come together, and the relationship of that to how they fall apart. Once again, I found myself turning to Bateson, this time to his idea of "schismogenesis". It seems to me that many such communities experience precisely the symptoms of what Bateson called "complementary schismogenesis" (in which initial solidarity is broken down through interactive patterns characterized by complementarity) and "symmetrical schismogenesis" (in which initial solidarity is broken down through interac-patterns characterized by opposition). An example of the first is dominance/submissiveness, or rule-enforcing/rule-breaking. An example of the second is a difference of opinion which turns into an argument and then into a fight. After working through the collapse of various groups in these terms, I felt I needed a comparable concept with which to describe different basic ways of coming together. With some reluctance, I coined the term "sociogenesis", and identified several types. The most difficult part came next, trying to establish a link between a particular type of sociogenesis and a particular type of schismogenesis. I have been developing this analysis for a paper which I presented in Point Loma, California, at the National Historic Communal Societies Association meetings, in October. I would also appreciate hearing from anyone who might be using the sc schismogenesis concept.

Perusing the Periodicals

Some recent articles using some of Gregory Bateson's ideas:

Bruce M. Knauft, "Ritual Form and Permutation in New Guinea: Implications of Symbolic Process for Socio-Political Evolution", *American Ethnologist* 12(2), May 1985, 321 340. An exploration of the roles of ritual in promoting political fragmentation or expansion. Emphases in the patterns of ritual form apparently affect responses to culture contacts dramatically. Knauft probes the bases for reactions by one cultural group to ritual symbolism of another group.

✱ For erratum regarding this answer, see CC number 5, page 9.

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Robert I. Levy, "Horror and Tragedy: The Wings and Center of the Moral Stage", *Ethos* 13(2), Summer 1985, 175-187. Issues of *entering into* social roles are considered as of different "logical type" than issues of *acting* out social roles. The classic horror story, exemplified by *Dracula,* depicts the universal problems associated with moral entrance, while tragedy, exemplified by *Antigone,* depicts those problems associated with moral performance, according to Levy.

Luiz Costa Lima, "Social Representation and Mimesis", *New Literary History* 16(3), Spring 1985, 447-466. "For the experience of the vulnerability of each partner as regards the other is basic in any human relationship... even the most innocuous conversation stages a little theatrical scene... What is one to do, then, about the other's invisible mentation, whence derives the vulnerability in interhuman relations? Because of and against them we build up 'frames'... which /let/ the interlocutors... *regulate* their verbal comings and goings. Representations are these multiple frames we fall into without staying in them..." "A representation of representations, mimesis presupposes between representations and its own scene a separation that makes it possible to appreciate, know, and/or question representations."

Niklas Luhmann, "Society, Meaning, Religion – Based on Self-Reference", *Sociological Analysis* 46(1), Spring 1985, 5-20. Theories of self-organization and self-regulation applied to the sociology of religion.

Howard F. Stein, "Psychological Complementarity in Soviet-American Relations", *Political Psychology* 6(2), June 1985, 249-261. "Us" vs. "them" on a global scale! Stein proposes the arm race as an example of a "symmetrical" runaway (positive feedback) system. "I have come to conclude that the question we usually ask, namely 'Which side should I take in the dispute?', only further contributes to the problem in the guise of appearing as a solution."

Bateson's Books Reviewed – Part 2

(Continued from Issue 2.)

Included below are reviews of books by and about Gregory Bateson which have been seen by the Editor of Con*tinuing the Conversation.* Readers are urged to send information on reviews not listed, especially information on reviews appearing in the foreign press.

Steps to an Ecology of Mind (1972):

American Anthropologist 76, 1974, 370.
Christian Century 94, 1977, 487.

Etc. 31, 1974, 101.
New Statesman 86, 1973, 19.
New York Review of Books 19(6), 29.
Psychology Today 7(6), 1973, 138.
Western Political Quarterly 26, 1973, 345.

Our Own Metaphor (1972):

American Anthropologist 77, 1975, 360.
Kirkus Reviews 40, 1972, 357.
Library Journal 97, 1972, 3998.
Publishers Weekly 201(14), 1972, 54.
Technology and Culture 15, 1974, 146.

About Bateson (1977):

Booklist 74, 1977, 116.
Library Journal 102, 1977, 2270.
Times Literary Supplement (3972), 1978, 542.

(To be continued in Issue 4.)

Bateson/Mead Reminiscences on Tape

A 30-minute cassette recording of a talk by Mary Catherine Bateson, "Gregory Bateson and Margaret Mead: A Daughter's Reflections", is available for $7 from Cambridge Forum, 3 Church St., Cambridge, MA 02138.

Call for Contributors

Continuing the Conversation needs inputs from you! Deadline for Issue 4 is March 1, 1986.

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Continuing the Conversation

A Newsletter on the
Ideas of Gregory Bateson

An Epimetaparable

By Carol Wilder, Associate Professor of Communication Studies, San Francisco State University, 1600 Holloway Ave., San Francisco, CA 94132. Copyright 1986 by Carol Wilder.

Once upon a time not so very long ago, Joy and Consciousness Love III arrived at the land of Narcissia.

Joy and Con III ("Trip" to his friends, for triple) were married by Fritz Perls at the Fall equinox in the hot baths of Esalen. Virginia Satir was maid of honor, being near-youthful herself in this year of nineteensixty-whatever. Joy and Trip had a peak experience of a honeymoon, taking off their clothes in public and freely sharing their love and trust.

Life went on. Joy and Trip, due to heavy vibes from the population bomb, issued 1.5 children and settled into a life of self-disclosure and authenticity in the Mission District of San Francisco, claiming that the multi-cultural area would most certainly benefit little Adam and the *very* little Star. Who, you see, was only half-there, a .5 child being what it is.

It was shortly after Joy was mugged for the third time that the family headed north to Mendocino County, to give the children some real country space and help them to get clear with the land.

The journey was light; the $4000 stereo long gone from the first break-in. It was irreplaceable anyway, as Joy and Trip believed that insurance was a bourgeois manifestation of interpersonal distrust. Besides, they couldn't afford to replace it: Trip had given up a good family name and law practice to work for the whales, and Joy's income from her separate and equal receptionist's position at the Women's Crisis Abuse Referral Collective didn't bring much in, funding to community agencies being what it is.

The rest of their possessions they recycled to the thrift shops, from whence they had come.

But Mendocino, living in the country, would be different.

It was, indeed, very different. Especially since the five acres that Joy and Trip had bought (with the very last of Trip's trust fund) had many redwood trees, but no running water.

Now, it wasn't so bad walking down the mud path with children and a water bucket. But walking Lap_ the mud path to the dome with 1.5 children and twenty gallons of water, three times a day, took its toll on Joy.

One night, a cold one that got ahead of the supply of firewood, Trip asked if Joy might not mind getting in touch with some log-splitting.

Joy turned slowly in her chair, raised her liquid brown eyes, and said "Fuck off".

Trip, dismayed by her lack of unconditional positive regard (while holding equally that he should do his thing and she her thing, and que pasa, pasa, if you know what I mean), could only respond: "Do I hear you saying that you have gotten in touch with your negative energy space and feel comfortable sharing getting clear with me?"

"No, Trip. You hear me saying 'Fuck off' ."

Joy trembled as Trip walked slowly out the door and down the path. I've done as much as shot him, she thought, but she couldn't move to follow.

And soon his spine shriveled up and he was gone.

The children asleep, Joy sat in the cold quiet, fearful of going outside even to split a new log which, of course, she now had to do herself.

Suddenly, the deafening silence was interrupted by the unmistakable crunching sound of footsteps on redwood droppings.

"Trip!" she cried out, certain that he had returned.

Again, "Trip!!" Still no answer; more steps.

In an instant, at the door of the dome, she saw Him. It was not Trip, but a ragged, stooped, and bearded old man, holding a curious bow that strung two arrows: one flint pointed directly at Joy's temple; the other pointed directly at his own.

Too frightened to speak to the man, but too frightened not to, Joy softly inquired who he might be, passing in these woods at this late hour, with the coastal fog well in.

"I am the deposed Chief Paradox Hunter," he replied, "and I escaped banishment from my tribe to wander aimlessly in the infinite regress. Please, miss, take no note of me, but while ya do—or don't—would ya mind makin' a warm cupa tea?"

Joy edged toward the wood stove; then away.

"But only if you'll split some firewood first," she insisted, her spirit coming back.

He returned before the water boiled, and placed the fresh logs deftly into the fire. Joy paced in small circles by the stove.

Tea was served.

It was long moments before they spoke.

The old man, his double-fletched bow at his side, had sunk before the fire, his long frame curled with exhaustion. Joy, well trained in interpersonal relations and feedback skills, asked "So what the hell are you doing here?" feigning that such boldness was characteristic.

"Well, it's a true story, and then again it ain't," said the Hunter, eyeing his bow with some affection.

"I seek Truth," said Joy. "Please continue."

"Well, like I said, it ain't truth and it ain't not, but it's sure a story, though one I wouldn't pay no heed to if I were you."

Joy's silence convinced him that he either had an attentive audience or one whose inattention was just as well.

"You ever been to Narcissia, young lady?" he began.

"Why yes, of course, for a time. I mean, like, I still have my Gestalt and Rolfing merit badges. They're sewn on my old fringed suede jacket. Wait, I'll get it..."

"No, no. Hold on. There's no reason to believe ya or not. Anyhow, it don't matter. I don't believe in believin' ."

Joy sat slowly, curious and less afraid. She'd been away from the Southland of Narcissia for some time, and welcomed any news. "Do tell your story," she said.

"Well , I never mean what I say and don't never speak for myself, neither, so don't take this too serious. But I'd swear it happened if I weren't so unsure of my uncertainty."

The fire was warming up. So was the old man.

"You must have come here before the revolution, miss, the way you talk. So I'll start there.

"Once upon a time in Narcissia the people got restless. They weren't peaking all the time, they weren't getting al 1 the warm fuzzies they 'd been promised, and they had to maintain empty jobs to maintain empty relationships, which they were told

would change. They did, of course, change: into other empty jobs and other empty relationships. Life was one damn thing after another, and if it wasn't that it was the same damn thing over and over again. No one was happy even most of the time, not to mention all of the time, as the Narcissia Doctrine had promised.

"About that time a small group or two of ragtags called the Peninsula Tribe began babbling in strange tongues, suggesting that maybe things just weren't all that simple or easy. This Peninsula Tribe, divided as they were even among themselves, spoke to only a few people—mainly crazy veterans—so no one took heed for a long time. But in talking among themselves and to crazy veterans and to magicians and to hypnotists and to monkeys and even to otters and octopi, if you can believe that, they developed a whole new language. A language that would have been outlawed forthwith in Narcissia, if only the Narcissia Council had understood or even listened.

"There was a lot of talk about paradoxes and types and analogues and digitals and punctuations and reframings and systems and homeostases and equi finals and multi-finals and binds and loops and quids and pros and quos and OH!! My, my, my. It was very strange indeed. At least at first.

"The founding elders of the Tribe warned time and again that there was no Truth with a big 'T '. While the elders sometimes squabbled among themselves, they all agreed that what they were doing was offering another point of view; hints from the Heuristics, which is the name they would have chosen for themselves at the time.

"But at some point, and it is unclear precisely what happened, the disciples of the Peninsula Tribe elders came to take the canon 'There is no Truth' as the only truth. And many people were attending systemic languaging rituals and positive connoting ceremonies and patterning parties and the like.

"Well, it's hard to say just when things got carried away, but suddenly erupted the Revolution of the Epistemological Discontinuity, and the Peninsula Tribe disciples purged the Narcissia Council. And there were trials for many in the land. The trials were a most unpleasant era, but the Ministry gave us no choice."

"Trials?" interrupted Joy. "What trials?? This is becoming very hard to get behind!"

"Well, the Narcissia trials were held at Esalen, in the hot baths. Those suspected of being Orthodox, rather than Paradox, were boiled in the tubs in massage oil. Those who died were presumed innocent; those who survived were found guilty of Orthodoxy and banished to the Infinite Regress. It was a nasty, nasty, nasty time. But the trials had been ordered by the Ministry of Paradoxical Intervention, and we couldn't metaintervene.

"At any rate, I was a good disciple during this time, and was then promoted to Chief Paradox Hunter. By then all of the Tribe elders were being ignored by the young zealots, but still I began secretly to question the doctrine of the paradoctrine. I began to feel that something had gone awry; that we were somehow little different from the Narcissia Council.

"While it would have been best to keep such thoughts to myself, I confided my doubts to my superior in the Ministry. I told him that I thought something was wrong. I told him I didn't feel right anymore hunting paradoxes all the time, catching them, giving them Latin names, counting them, and putting them in the little sorting bins we had made up for the different species. I told him that maybe I needed a rest, or a change of jobs. I'd heard that the Institute for the Abolition of Lineal Thinking had a few openings, and that I'd like to apply.

"He would have none of it. He was outraged that I would dare question the truth of the no-truth and the rest of the paradoctrine. He said to me:

'You are not, comrade, thinking systemically. Your lineal monadic teeny-tiny little intrapsychic quantitative Aristotelian left-brain is barking up the wrong epistemology once again. You

have very well understood to this point the quid pro quo of our homeostasis. But if you insist upon refraining the punctuation of my metacommunicative commands, I have no choice but to banish you into Infinite Regress.'

'Oh no!' I cried. 'Not the land of a million mirrors!! I'll repent! I accept the doctrine of the paradoctrine!! The truth of the no-truth!!'

"But I knew it was too late. I grabbed my bow and ran from the inquisition room into the woods. I have been in hiding since, living in the forests. They will never take me to the land of the million mirrors. Never!

"Which is how, miss, I came to these woods and to this dome and to this story, which begins 'Once upon a time...'"

<div align="center">

MORAL:
If you change the words but not the music,
the malady lingers on.

</div>

(Editor's Note: *Rigor & Imagination: Essays from the Legacy of Gregory Bateson,* edited by Carol Wilder and John H. Weakland, is now available in a paperbound edition for $11.95 postpaid, from Praeger, 521 Fifth Ave., New York, NY 10175. This book was born at the Asilomar Conference in 1979, where talks were given by Gregory Bateson, Kenneth Burke, Paul Watzlawick, Heinz Von Foerster, and many other scholars.)

Wake Up and Go to Sleep!

By Elisabeth H. Thomas, 1311 Prospect Ave., Brooklyn, NY 11218. Copyright 1986 by Elisabeth H. Thomas.

<div align="center">I</div>

Brilliant as he was, Bateson trapped himself and us all in a monumental paradox: he tried to use conscious process and prose to demonstrate the uselessness of conscious process and prose.

I tried to use Bateson's theories to consciously free myself from an unconscious legal system called 'schizophrenia'. The attempt drove me nearly to suicide.

In *The Politics of Experience,* R.D. Laing observes :

And any *theory* not founded on the nature of being human is a lie and a betrayal of man. An inhuman theory will inevitably lead to inhuman consequences—if the therapist is consistent. Fortunately, many therapists have the gift of inconsistency. This, however endearing, cannot be regarded as ideal.

In my suicidal frenzy, I luckily remembered the Batesonian principle that no component can explain the system of which it is a part; this would mix logical types and generate paradox. This bright ray led me from various hallucinations to many hysterical phone calls and an eventual sojourn at Esalen Institute.

I am reminded of a scene from a "Star Trek" episode:

CAPT. KIRK: "So, Mr. Spock, you examined the problem from all angles and logically reasoned that it was time for an emotional outburst?"
SPOCK: "I would not state it in exactly those terms, Captain; but, those are essentially the facts."

<div align="center">II</div>

I could not make it through issue #3 of *Continuing the Conversation.* I skipped happily through Philip Stew-art's article; but, when James McNeley began to bludgeon me with terms like "genuine dialogue" and "sustainable economic alternatives", my thoughts slid away to Sam Shepard's play "Curse of the Starving Class":

It's a zombie invasion. Taylor is the head zombie. He's the scout for the other zombies. He's only a sign that more zombies are on their way.

III

I once went to a psychotherapist who worked by the method called "systems theory". It purports to be based on Bateson's (tangled) theories. The therapist and I energetically followed the premise that, if I could adopt new and endearing modes of behavior, I could change my relationships with my family members and feel happy. However, I was required to avoid realizing (paradox #1) that I was actually trying consciously to change my entire cognitive structure (paradox 42) with the ulterior motive of changing the behavior of all of my family members (paradox #3—luckily, we were not interested in their cognitive structures, or we would have generated a fourth paradox).

At Esalen, I dreamed that I was desperate to get a light fixture to work so that I could see myself in the mirror. Someone earnest but clearly naive (my own intellect , I believe, and my old therapist) kept handing me light bulbs into my right hand (in gestalt, the right side represents conscious process). I was furious to find that, not only were the bulbs European, thus incompatible with the fixture, but that they were already burnt out. They were doomed from the start.

My own behavior changes were doomed from the start. They were a product of the desperate status quo, and therefore merely reinforced i t. They were a pretense.

All conscious attempts to change the world are, likewise, doomed from the start. My conscious attempt to convince you of this is doomed from the start.

IV

My mother is nervous about the plainness of her dining room table. She dresses it up with fancy tablecloths. We al l become slaves to these tablecloths. Dirty dishes must be removed carefully, one by one, so as not to stain the fancy cloth. Accidental stains must be painstakingly purged. My mother is a busy woman.

My nephews are bright children. They showed me the Chinese restaurant method for clearing the table: gather up the corners of the cloth and cart the whole mess away.

Back to "Star Trek": In one episode, a certain Dr. Corby crashes on a barren, frozen planet. He is badly injured, dying; so, he makes an android and moves his consciousness into it. It works perfectly for years. One day his old lover finds him. She is terrified to discover how ruthless he has become, horrified to find out that his body is actually a machine. He defends himself, saying: You have no idea what it was like! I was dying; my legs were frozen. The only thing between me and death was my intellect!" She challenges him to prove that he is still human; but all he can say is: "I can compute anything! I can solve any equation!"

Meanwhile, an android who has been programmed to protect Dr. Corby finds out that the doctor has become frightened of him and plans to disconnect him. He reasons: "You can't protect somebody who is trying to kill you!" and turns to destroy Or. Corby.

We have all built androids to protect our feelings, covered our plain emotions with elaborate tablecloths. But, the androids steal our identities, our voices, and the soul is imprisoned in muteness. Androids cannot have souls; souls cannot live without voices. The soul needs to speak with other souls in order to live. This is why solitary confinement is torture. This is why psychotics scream.

Traditional psychotherapy tries to force the person to surrender his soul to his android, as if that were even possible. Gestalt teaches methods for stealing identity back from the android. It uncovers the plain table. By intellect and willpower, we have created a schizophrenic world. More logic will only drive us to suicide.

Since returning from Esalen, I had a dream about a late, dear friend coming back to life. I was lying on one twin bed; his body was laid out on the other. I thought: "Maybe he's faking it!" And, as I watched, he opened his eyes, slid one leg off the bed, poked the floor with his toe as if testing the temperature of the bathwater, and withdrew, again. I called the others to gather around and wake him; and, sure enough, he sat up. He was sheepishly giddy, laughing, shaky. He explained that he had felt such an awful pain in his heart that he had been afraid he would die. In a flash, I understood that his autonomic nervous system had closed down to protect him and let him feel dead. I thought: "To think that we were all set to bury him that way!"

V

... the trumpet shall sound, and the dead shall be raised incorruptible, and we shall be changed. For this corruptible must put on incorruption, and this mortal *must* put on immortality.

I. Corinthians 15: 52 & 53

Words to Philip Stewart

By Janie Matrisciano, 65 Payson Rd., Belmont, MA 02178. Copyright 1986 by Janie Matrisciano.

(Editor's Note: "Words to Gregory Bateson", by Philip Stewart, was published in *Continuing the Conversation* NUMBER 4.)

What a lot of carping over nothing!

You say that Gregory didn't seem (on one sampling in 1979 at the age of what, 75?) to want to talk to children, or at least to your child, or at least on that occasion. Certainly *With a Daughter's Eye* doesn't show Gregory as a closet Mister Rogers either, but so what. Could Mister Rogers write *Mind and Nature?*

Ah yes, *Mind and Nature,* that so difficult book. Why assume that if Gregory's language seems tortuous (to you, anyhow) he "avoided" writing more simply? Perhaps he wasn't a good enough writer to write simply enough (for you). Perhaps he felt that it was all he could do (and plenty enough for some of us) to do the thinking he did and get it on paper, leaving us to do a little of the work ourselves in following his thought. Perhaps his writing seems less than simple because the ideas it conveys are less than simple. Or perhaps they're simple after all, but seem difficult to us because they challenge so much of what we thought was common sense. Perhaps Gregory just didn't think his job in life was the same as Isaac Asimov's. I haven't heard that Isaac is going around trying to do Gregory's.

As to Hofstadter's *Gödel, Escher, Bach,* you put me off reading it for a long time." What, you accepted a book review from a man who couldn't talk to children? I waded through it without waiting for Gregory 's personal review. I thought it was fun and incredibly long-winded. From it I gained some knowledge I didn't have before, but I have never been remotely tempted to go back and reread any of i t. Funny how differently I've treated Gregory's books. I've waded through them too, at first because they were so difficult (not their language but the thinking they contain) and later because I found that no matter how many times I read them I learned something new every time. Hofstadter is like a man who found a bit of landscape he liked and photographed it from a mil lion different angles. Gregory is like a man who went out and explored new landscapes and pointed out the way to them so that we could explore them, too, hoping besides that we wouldn't sit still but would explore even further. From whom is there more to learn?

Not knowing you, your son, or Gregory, I probably have no right to make the following guess. But David Lip-set says that Gregory resented his father's naming him after Gregor Mendel, and maybe Gregory was put off at some subterranean level by your hero-worshipping approach with a son named after him. Isn't it more than a little naive to expect that a stranger after whom you have named your child will be flattered and grateful? Maybe by contrast he thinks its a presumptuous nuisance on your part to have done it.

Finally, how patronizing of you to assume that Gregory spoke slightingly of Hofstadter because he was chagrined that Hofstadter had revealed that the "Theory of Logical Types had been blown sky-high in 1931". Maybe Gregory was not the only person who had not read Gödel (are you sure he didn't?); but I bet Hofstadter isn't the only one who has! (Or who has heard of him, and not only heard of him but read and appreciated Gregory Bateson too.) It might be said that Newtonian mechanics was blown sky-high by the theory of relativity (also by a thinker who challenged what we thought was our common sense), but that doesn't mean Newtonian mechanics isn't still perfectly adequate to predict forces and motions throughout the everyday range of experience and beyond. Perhaps Gregory knew quite well that a blown-sky-high Theory of Logical Types could still be used to explain hundreds of phenomena in the everyday range of communication and personal interaction.

How do you know Gregory didn't "live wisely"? Who gets to define "wisely"? How do you know he would still be with us if he had lived "wisely"?

What a pity it has to be this way! Our heroes can't be all things to all men, and they can't be all things even to single men who idolize them and then get disappointed. What a pity Gregory couldn't have been Gregory, Mister Rogers, Isaac Asimov, and Jack LaLanne all rolled into one just to make things convenient for you!

****

A serious afterword: You say to Gregory, "So much of what you said is new and important, I want to wrestle it out into a form that ordinary people can approach... If your ideas are ever to be fare for more than a small intellectual minority, you will have to do better. And so it is that for years now I have been struggling to translate you into plain English."

Which ordinary people? Ordinary people like me? I was one of a few "lay people" at the Bateson symposium at St. Benedict's college last spring, sitting in on the edges of conversations among family therapists, philosophers, and so on. I was an ordinary person in the sense that I did not have a professional reason for being at the conference; I was there because Gregory stands near the top of the list of people from whom I have learned important things in life.

But all ordinary as I might have seemed in contrast to people who deal with Gregory's ideas as specific, living issues in their work, I am hardly the "ordinary" person who rarely reads anything and is quite content to leave ideas, however difficult or simple, to a small intellectual minority.

So which kind of ordinary did you mean? Do you want Gregory's ideas translated into comic book form so they'll reach masses of kids? Do you want the Cliff Notes to *Steps* and *Mind and Nature* published to help undergraduates answer exam questions? Do you want Margaret Mead to come back and translate Gregory's ideas into a form suitable for women's magazines? Or maybe you want a new George Bernard Shaw to come and write plays that try to teach his thoughts under the disguise of popular comedy?

I fully agree that it might be of some use to the world if more people had absorbed more of what Gregory was trying to say, but need that happen under Gregory's name? Or might it hap-

pen with the ideas seeping into common usage over time and through mixed channels? I don't have any answers on this, but I would suggest *Our Own*

Metaphor as one source of information about Gregory's thinking on the dissemination of important ideas to "ordinary" people via propaganda or any other method. But then, if anything *Our Own Metaphor* is more difficult to read than *Mind and Nature.* Good luck to you.

Boulder, Colorado; Summer, 1975

By Lion Goodman, 38 Glen Dr., Mill Valley, CA 94941. Copyright 1986 by Lion Goodman.

The peak of those days of bliss—freshly graduated from the University of Colorado, my degree major was titled "Physiology and Human Consciousness". I was free, with few cares and a liberated spirit. I floated through the town's summer community, attending Naropa lectures and events as if I belonged there. In fact, I was a "local", unusual among the student immigrants from New York, California, Chicago, and the like.

I was sitting on the floor, cross-legged, just to Gregory's right, looking up at him with grand respect and admiration. He was seated on a large stuffed armchair, breathing a bit effortfully between his sentences, which I hung onto like life preservers in a rough sea. After battling my way through stiff and rigid professors at the University, here was a grandfather who could tease and challenge, discuss consciousness as if it were a fit subject for discussion (unlike my neurophysioloqy professor who argued with me vehemently about the notion of consciousness, and how it didn't "belong" in his class...).

I was alert, awake, listening to Gregory with full and rapt attention. He was discussing reflexes in animals and behavior: "And like all other animals, we react when things like this happen —" and with that his hand shot out from his and into my face.

From my point of view, I heard his words and watched his hand move toward my eyes. I observed the thick and callous fingers as they flicked an inch away from my eyes. I looked up at Gregory and smiled. I had not blinked.

He looked perturbed, then pleased, harumphed, and said Well *usually* that would have produced a blinking reflex." Much laughter in the audience. Gregory looked down at me with a look that said, smirking, You rascal!"

Later in the morning, he discussed one of his favorite questions: "How is it that a mirror switches left and right, but not up and down?" Many students rambled on in an attempt to reason it out, based on binocular vision, the physics of reflectivity, and gravitational orientation. Bateson merely smiled and shook his head. "No, no, keep thinking," he cajoled.

At the break, I went up to him and whispered, "I know the answer." He looked down at me, recognized "the rascal who would not blink", and raised his eyebrows. "Oh?" he disbelieved. When I told him the answer, he again was shocked. "How did you know that?" he asked. I wasn't sure which question he was asking—was it "How did you go about figuring it out?" or "Where did you learn it?" or "Who is the one who knows?" I shrugged coyly, leaving him more mystified as to who or what I was.

My goal in those days was to be outrageous, and to Make an Impression. I made my impression on Gregory, as he made his on me. I wish only that I could have spent more time with him, sharing more of the cosmic jokes he knew so well.

(Editor's Note: Lion's explanation of the mirror paradox is given on page 6 of this issue. Try to figure out your own explanation before turning to the "answer". And for a fuller discussion of mirror reversal and other topics related to the mathematics and physics of symmetry, see Martin Gardner's *The Ambidextrous Universe: Left, Right, and the Fall of Parity,* Mentor (New American Library), New York and Toronto, 1969.)

Maps vs. Territories

By Michael Melius, R.R. 2, Box 40-C, Hermosa, SD 57744. Copyright 1986 by Michael Melius.

I've just received my first issue of *Continuing the Conversation* (NUMBER 4). I am concerned that it might deal too much with Bateson the man and not enough with his ideas.

As regards maps vs. territory: my concern in this respect is that modern people are becoming ever more satisfied with a mediated (mapped) version of the world, be it via books, film, TV, art, etc. And to what extent are these fictional lives ("half acting, half watching; all eating") feeding off the real world, indeed masking their destructive effects on it? Are we ready to live on earth-as-space-station? Is the earth ready? What stories will we have when the earth itself is legend?

Bateson Books Reviewed – Part 3

(Continued from *Continuing the Conversation* NUMBER 4.)

Included below are reviews of books by and about Gregory Bateson which have been seen by the Editor of *Continuing the Conversation.* Readers are urged to send information on reviews not listed, especially reviews appearing in publications outside the U.S.

Mind and Nature (1979):

American Anthropologist 84, 1982, 210.
Annals of Science 37, 1980, 690.
Booklist 76, 1979, 4.
Choice 16, 1979, 1326.
Christian Century 96, 1979, 1096.
Christian Science Monitor, July 9, 1979, B3.
Contemporary Review 236, 1980, 51.
Harvard Educational Review 52, 1982, 97.
Humanist 40(5), September/October 1980, 45.
Kirkus Reviews 47, 1979, 227
Library Journal 104, 1979, 1462. Listener 104, 1980, 118.
M L N 94, 1979, 1219.
New Scientist 84, 1979, 449.
New York Times Book Review, April 29, 1979, 9.
New Statesman 99, 1980, 515.
Parabola 4(2), May 1979, 96.
Psychological Record 30, 1980, 291.
Psychology Today 13(77 December 1979, 110.

Reviews in Anthropology 8, 1981, 18.
Times Literary Supplement (4051), November 21, 1980, 1314.
Wilson Ouarterly 8(5), Winter 1984, 84.
Zygon 15, 1980, 241.

Gregory Bateson: The Legacy of a Scientist, 1980 and 1982:

American Anthropologist 86, 1984, 427.
American Journal of Psychiatry 139, 1982, 146.
Booklist 76, 1980, 1164.
Humanist 43(6), November/December 1983, 39.
Journal of Communication 31, 1981, 236.
Kirkus Reviews 48, 1980, 491.
Library Journal 105, 1980, 1507. Man 16, 1981, 314.
New York Times Book Review, June 22, 1980, 15.
New Yorker, August 18, 1980, 92.
Publishers Weekly 217, 1980, 82.
Science Books and Films 16, 1981, 193.
Science Books and Films 18, 1983, 270.

(To be continued in *Continuing the Conversation* Number 5.)

Perusing the Periodicals

Recent articles related to the ideas of Gregory Bateson:

Jay Haley, "Conversations with Erickson", *Family Therapy Networker,* March-April 1985, 30-35, 39-43. Transcriptions of discussions between collaborators in the "Bateson project" at Menlo Park and Dr. Milton Erickson, from 1958 to 1961. Mostly Erickson, Haley, John Weakland, with occasional comments by Bateson, on issues in family therapy. Excerpted from three books available from W.W. Norton & Co., 500 Fifth Ave., New York, NY 10110: Conver*sations with Erickson; Volume 1, Changing Individuals* ($ 24.50), *Volume 2, Changing Couples* ($ 17.50), and Vol*ume 3, Changing Children and Families* ($ 17.50).

Barbara S. Held and Edward Pols, The Confusion About Epistemology and 'Epistemology'—and What to Do About It", *Family Process* 24(4), December 1985, 509-517; Heinz Von Foerster, "Apropos Epistemologies", *Family Process* 24(4), December 1985, 517-521; and Barbara S. Held and Edward Pols, "Rejoinder: On Contradiction', *Family*

Process 24(4), December 1985, 521-524. Held and Pols distinguish a "classical", or philosophical meaning of epistemology (the study of the nature of knowing) from another meaning of the term, prevalent among family therapy theorists (namely, the basic assumptions made by individuals or groups of individuals,

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for example regarding free will and determinism). They claim that the second notion of epistemology is actually *metaphysics* or *ontology* as de- fined by philosophers since the Greeks. And : "It is contradictory to hold both an epistemology (meaning 1) which maintains that reality (or the world) is a function of ourselves as knowers (of our subjectivity, our theories, or our language) and an epistemology (meaning 2) which maintains that reality *really has* certain features that are independent of the knower—features that should be acknowledged by every investigator. One example.., of such a supposed feature of nature in general , or at least of nature as encountered in family therapy, is circular causality. It is a supposed feature argued for by some of those whom we perceive to be laboring under the burden of that contradiction." (pages 521-522) "... a thoroughgoing anti realist epistemology... does not leave any kind of explanation exempt from the doctrine it propounds." (page 523)

Ivan Karp, "Deconstructing Culture-Bound Syndromes", *Social Science and Medicine* 21(2), 1985, 221-228. Are "ethnic psychoses" pathological? Perhaps anorexia and bulimia are examples of culture-bound syndromes in current American society. "All con- ventionalized forms of commentary (culture-bound syndromes are commentary) are parasitic... They are defined by what they comment upon, and not vice-versa. The commentary is achieved by means through the transformative activity of producing the everyday in different frame. The result is that the message com- municated is not what the overt content seems to be. Instead it is about the contradiction between overt content and extraordinary context." (page 223)

George E. Marcus, ''A Timely Rereading of *Naven:* Gregory Bateson as Oracular Essayist", *Representations* (12), Fall 1985, 66- 82. Revised version of a paper given at a symposium on Bateson at the Second Annual Conference of the Humanities Institute, Uni- versity of Southern California, September 1983. Naven as "failed" "experimental writing", a literary form to which Bateson never returned. "... Bateson's highly developed hermeneutic sensibility... remained repressed within stronger commitments to a tradition of scientific empiricism, corning mainly from his familial affinity to late nineteenth-century biology and natural history." (page 70) "The pathos of Bateson's influence on the world of disciplines is that, more oracle than writer, he remained uncertain of the gen- eral impact he wanted to have, particularly as he aged... He was appreciated in fragments, not holistically as a thinker...

The paradox of influence is that the more he was borrowed from—an idea here, an inspiration there—the more frustrating and anxious became the question of his influence personally to him... partial influence was a particularly salient violation of the holism that mattered most -the unity of his life's thought." (page 78) "Bateson's final vision is symmetrical with the epistemologi- cal concerns of Naven: the inability of conscious human purpose (a pathology) to grasp the whole (the entirety of interconnected man and nature), juxtaposed to the more modest inability of multilayered analysis in *Naven* to provide an adequate account of the totality of experience, feeling, and action in any slice of observed life. Bateson's attempt finally to overcome this epistemo- logical concern, writ large, is to undermine purpose by dissolving the individual, by conceiving mind as a system unbounded by the skin of the individual whose mind or brain is just a node in this larger system." (pages 81-82)

What Mirrors Do (and Don't Do)

In a mirror, left and right only *appear* to be reversed, because *front* and back have been *reversed* (or inverted, or flipped dimen- sionally), and "left" and "right" are *referenced by* the *direction* we are *facing*. To a mirror image of us, its "right" hand is in the right (that is, "right") place; only to us, as observers, is the "right" hand of the image on what we call the "left" side. Go stand in front of a mirror and check it out!!

Continuing the Conversation Will Expand..

... if more articles, comments, and queries are received from readers! (Some catch, huh?) If you've got the words, we'll make the space to promulgate them. Deadline for submissions for Issue 5 is June 1, 1986. Thanks!

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Continuing the Conversation

A Newsletter on the Ideas of Gregory Bateson

SUMMER 1986　　　　　Editor, Gregory Williams　　　　　**NUMBER 5**

Gregory Bateson Archive Opens This Summer

By Rodney E. Donaldson, Archivist, P.O. Box 957, Ben Lomond, CA 95005. Copyright 1986 by Rodney E. Donaldson.

The Gregory Bateson Archive at the University of California at Santa Cruz, which will open in the summer of 1986, consists of some 80 document boxes of correspondence, manuscripts, notebooks, transcripts, miscellanea, and octopus and cetacean observation records, as well as several larger boxes of tape recordings and films. Virtually all of the material in the archive dates from the years 1946-1980.

There are approximately 350 essays, the manuscript drafts of each of which have been placed in the order of their creation. There are approximately 4000 letters la Gregory Bateson, amid some 39 document boxes of correspondence—all of which have been placed in chronological order within each folder as well as provided with a name index and, in the case of Bateson's own letters, a word/subject index. Care has been taken to identify the full names of all persons mentioned in Bateson's letters, since this information would not survive the living persons familiar with his life and friends. Every allusion or reference in Bateson's own letters has also been identified by at least noting the name of the author from whom it derives.

In addition, there are some 76 notebooks, which have been identified and placed in chronological order. Also organized and cataloged are 4 document boxes of octopus and cetacean observation materials, Bateson's miscellaneous holograph notes and manuscript fragments, some 500 tape recordings, over 60 Bateson films (mostly dating from after 1947), and various miscellaneous items, including conference and workshop transcripts, marginalia, articles about Bateson, photographs and slides, and supplementary books. Appropriate cross-references have been provided for all parts of the archive. (Also organized and cataloged were two large boxes of papers and personal effects of Gregory's parents, the geneticist William Bateson and Caroline Beatrice Bateson. These boxes were sent to join William Bateson's library at the John Innes Institute in Norwich, England.)

A definitive Bibliography of the Published Work of Gregory Bateson (superseding both the *Steps to an Ecology of Mind* and the *American Anthropologist* bibliographies) has been compiled from original sources, and a Published Articles File has been created to match the Bibliography. A catalog of Bateson's library has been prepared, as well as steps taken to ensure that his most important annotated books joined the archive. Finally, the manuscript material for Bateson's last 3 books has been cataloged (along with several uncompleted and abandoned book manuscripts dating from the 1960's), and a Guide/Catalog to the archive has been prepared, including a detailed chronology (made especially meticulous for the years not covered by the UCSC archive).

Throughout, it has been the aim of the archivist to perform what every literary executor and archival repository would wish done with the material entrusted to their care, namely, to order it, to devise means to preserve that order despite use by many persons over a period of years, to identify items which persons without the benefit of many years of study could not otherwise identify, and to distinguish the final form of potentially publishable documents from their various incomplete versions. In short, it is hoped that the work of Bateson scholars and students has been rendered easier at the same time that maximal preservation of the materials has been ensured.

Bateson' s pre-1946 material may be found in the South Pacific Ethnographic/Margaret Mead Archive of the Library of Congress.

A copy of the Archive's Bibliography of the Published Work of Gregory Bateson may be obtained by sending $ 9.00 to R.E. Donaldson, P.O. Box 957, Ben Lomond, CA 95005.

The Map-Territory Relationship Revisited

By David Shiner, 322 N. County, Waukegan, IL 60085. Copyright 1986 by David Shiner.

My article "Gregory Bateson and the Map-Territory Relationship" first appeared in *Continuing the Conversation* Number 3. Greg Williams and I agreed that he would solicit responses to the article and that I would subsequently respond to these responses. That's the purpose of this article. (How many more responses to responses to responses, you ask? Well, I'm not averse to the prospect of an open-ended sequence of recursive feedback loops.)

Let me begin with my hopes and intentions. I want to contribute what I can to the conversation on Bateson's ideas. Others have contributed fiction, biography, and poetry. I enjoy and respect these contributions, but I cannot emulate them. I hope that CC readers will appreciate the efforts of me and my philosophically-minded cohorts.

Many academicians write articles and letters which consist largely of snide carping. I have no desire to join their number. I present this article as I intended its predecessor, in the spirit of critical but supportive mutual understanding of the ideas of Bateson.

The 6 responses to my original article can be divided into 3 distinct categories, each containing 2 letters.

The first category consists of summary reflections, the second of restatements of views by speakers at last year's Bateson Symposium in Minnesota, and the third of substantive critiques of my essay. Al though I cannot consider each letter as fully as I would like, I will offer my thoughts on each...

(Editor's Note: For better or worse, I have decided to print the remainder of Dr. Shiner's article *following* the 6 papers to which he is replying. I hope that the losses of this disconnected approach will be more than balanced by the gains of allowing readers to consider the 6 papers—given Dr. Shiner's introduction to them— before examining Dr. Shiner's interpretations of them.)

Strong, Brief Reactions

By Avery R. Johnson, Ph.D., Armory Rd., Milford, NH 03055. Copyright 1986 by Avery R. Johnson.

I am pleased that I have been asked to review an article in your newsletter... I have 2 strong reactions to it, and I can state them very briefly.

#1: "*SO WHAT*?"

And since I have an aversion to "isms" of every stripe and to pedantic fussing over exactly who said what and where and when, my other reaction is:

#2: "*DR. SHINER, WHAT DO YOU THINK*
    (about *Dingen an sich,* etc.)?

The intellectual position I would favor was expressed so well by my former mentor at M.I.T., Professor Warren McCulloch, in a poem he had written on his 21st birthday:

<div align="center">

APPOINTMENTS*

November 16, 1919

(His Birthday)

</div>

Yesterday:

> Christ thought for me in the morning.
> Nietzsche in the afternoon.

Today :

> Their appointments are at the same hour.

Tomorrow:

> I shall think for myself all day long.
> That is why I am rubbing my hands.

*W.S. McCulloch, *Embodiments of Mind,* M.I.T. Press, Cambridge, Massachusetts, 1965, p. 320.

"Isms"

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I am glad to respond to your request for a comment on Shiner's article.

Here is Shiner's summation:

> There is, I believe, a lesson to be learned here. As followers and appreciators of Gregory Bateson, we should be grateful to those who have worked to give his views a broad hearing. We should not allow such gratitude to blind us to the actual content of their claims. If Maturana, von Glasersfeld, et al., are merely working on what the Bateson Symposium in Minnesota termed "the questions of Gregory Bateson", then their work merits a good deal of praise. However, if they are claiming that their answers to these questions are identical to those proposed by Bateson, they need to reconsider whether the maps they are drawing bear sufficient resemblance to the territory they are exploring. (1)

This, for me, clarifies certain inchoate feelings I experienced at some of the proceedings in Minnesota, and on reading some of what has been written about Gregory Bateson. While Bateson was certainly an intellectual, fond of "abstract" thought in the sense of thought that is culled from an immense variety of experience and synthesized into a whole, he was intolerant of "abstract" thought in the sense of philosophical "isms": thought which is removed from experience. Experience is what Gregory called, with great reverence, "The Data". We never see data "raw"—they are always "cooked", to some extent, by mind. But data, for Bateson, IS, whereas "isms", to put it simply, ain't. That is why he was so fond of Korzybski's "The map is not the territory". This "map is not the territory" is not a philosophical stance, but a fundamental verity of our world. At the Minnesota symposium, constructivism and relativism and many other isms were flying about the air

fast and thick, but Gregory Bateson *never* identified himself with an ism or a "school"—this is one reason why his work seemed always so difficult to classify into a "discipline" and why it was so difficult for him to be accepted by academia.

In *Mind and Nature,* he wrote:

> Why do schools teach almost nothing of the pattern which connects? Is it that teachers know that they carry the kiss of death which will turn to tastelessness whatever they touch and therefore they are wisely unwilling to touch or teach anything of real-life importance? Or is it that they carry the kiss of death be*cause* they dare not teach anything of real-life importance? What's wrong with them? (2)

"School" here means both (teacher + students in the classroom), and (groupings of teachers who do battle with each other over the names of names of theories).

Yes, the various isms have a basis in reality, and in the good intentions of those who propound them, but they quickly become mere words, or what he called "dormitive principles" (see Bateson's discussion of dormitive principles, reification, and misplaced concreteness in the introduction to *Steps to an Ecology of Mind).* That is why Bateson always identified himself as a naturalist, a biologist who concretely observed the behavior of plants, animals, and humans. And in his last years he turned increasingly towards issues of aesthetics and art, which propagate the Pattern Which Connects in direct sensory experience of sound, image, word, movement.

During the symposium in Minnesota, Mary Catherine Bateson had the audience stand up and play Anatol Holt's patty-cake game as an experiential demonstration that the human being is not a thing bounded by a skin. This (except for the exhibit of Gregory's own photography and filmmaking) was the single instance during the entire week of talk when a speaker gave us the opportunity to see an actual piece of data.

Yes, the isms have a basis in reality, and in the good intentions of those who propound them, but 2 essential components immediately go out the window. One is humor, the other is passion. These elements were every bit as central to Bateson as was his intellectuality and brilliance. His lifetime of intellectual work was firmly grounded in a profound love of life in all its varied forms.

Regarding Immanuel Kant: Bateson once came up to me and said, with a wicked leer in his eyes, "Guess what I have in my pocket." "I don't know, Gregory." "A *ding an sich!"* And he broke into a belly laugh.

(1) D. Shiner, "Gregory Bateson and the Map-Territory Relationship", *Continuing the Conversation* (3), Winter 1985, p. 4.

(2) G. Bateson, *Mind and Nature: A Necessary Unity,* E.P. Dutton, New York, 1979, p. 8.

Some Reflections

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A great thinker is great not only for the novelty of the things he or she says, but also for what he or she makes possible through the world that he or she brings forth through what he or she says. All this applies to Gregory Bateson.

I am not working on "the questions of Gregory Bateson", and if his and my questions coincide this is an expression of the times that we live in, because I did not begin to read Bateson until last year. Yet, I know that I come after Bateson and that whatever I do or say I do or say it in a world that he contributed to bring forth. Therefore, much of the value of what I say is such because I come after him and I am heard after him, regardless of whether

I follow his steps or not. Gregory Bateson as a thinker is a giant, and will be inspiring for his readers no matter what we say about him, and regardless of whether we agree or disagree with him as we read him.

When I say "the map is the territory" I am saying something different from what Bateson and Kant say. At the same time I am not denying that a map of a territory is not that territory. Unfortunately the expression the map is the territory" is a metaphor, and metaphors are misleading because the listener may not listen to them as such. Let me make clear what I say:

(i) I maintain that all there is is that which the observer brings forth in his or her distinctions. We do not distinguish what i s, but what we distinguish i s. The distinctions of the observer specify existence and isness.

(ii) I claim that language as a biological phenomenon is an ongoing process of recursive consensual coordinations of actions.

(iii) I claim that the observer arises in language, and that things arise in language when the observer arises. Therefore, I claim that all that exists exists in language as consensual coordinations of consensual actions of observers, the observer included.

(iv) I claim that the *ding an sich* cannot be asserted or accepted as having any kind of existence because existence is bound to the distinctions of the observer, and to accept the existence of what cannot be distinguished has no sense.

(v) When I say that the map is the territory, therefore, I am saying that nothing can be claimed to be a map of the *ding an sick,* not even in purely conceptual terms, because the *ding an sich* does not exist.

I do not know much of Bateson's thinking, nor do I claim that my answers to questions that he may have asked are similar to his, on the contrary, I am inclined to think that they are different. Yet, this does not impede me to value his work and honor and respect him for his contributions.

Kant, Constructivism, and the Territorial Dogma

By Ernst von Glasersfeld, 180 Shadybrook Dr., Athens, GA 30605.

In May 1985, when I called my brief talk at St. Benedict College "The Last Question", I thought it was obvious that I was referring to a question which to me—and perhaps to some others—had been left open by Gregory Bateson. It never struck me that anyone would jump to the conclusion that I had an answer, let alone would claim that any answer of mine would be "identical to those proposed by Bateson". As far as I am concerned, therefore, David Shiner's final admonition in "Gregory Bateson and the Map-Territory Relationship" misses the mark.

Thanks to the excellent tapes that were so lovingly provided by Maureen Opitz, I was able to refresh my memory about what was actually said and to confirm that I was not proffering answers but merely trying to sort out a few points in a problem that Bateson, like so many others, have been grappling with during the 2500 years of recorded Western thought.

To continue the conversation, let me say it as clearly as I can: I am competent neither to speak for Gregory Bateson, nor to argue *against* him. But I am quite willing to argue about Kant, the problems of rational knowledge, and the constitution of what we call "reality".

Kant, indeed, never *denied* ontological reality (nor did Mersenne or Vico, whom I mentioned), but he made it very clear that, in his view, there was nothing we could rationally know or say about it. Kant substantiated his position by saying that space and time were *Formen unserer Anschauung* (i .e characteristics inherent in our human way of seeing and experiencing) and that, thanks to these 2 inherent forms, we produce *Vorstellungen.* That last German word has created appalling misconceptions for English readers because it was unfortunately translated as "representations". To an English speaker, "representation" means a picture

or replica of something else which is to be considered the original. That would correspond to the German word *Darstellung.* The word that Kant used throughout would be better rendered by "idea" or "conception" or, indeed, "construct".

If one takes Kant seriously, it follows at once that what we call "structure" or "pattern" or "order" is always the result of placing things into space, time, or both.

If, now, these are forms that the human experiencer supplies out of himself or herself, it becomes obvious that we cannot possibly know what an ontological world might be like before we have placed it into these forms. We cannot imagine or visualize or conceive anything that is not in space and/or time, and even the term "existence" has no fathomable meaning without these forms.

Our maps do reflect a territory, but a territory has to be an arrangement in space and/or time, and that is, an arrangement of paths, of movements, and of actions we ourselves have made, and of the points where these movements and actions got stuck and went no further. It is naive wishful thinking to claim that such maps could reflect something beyond our experiential world in space and time (where the word "beyond" is already a questionable metaphor).

The differences we register in the manifold of our sensory experience, as well as those we notice in the realm of our conceptual operating, are just that—differences that we happen to be making with our ways of seeing, feeling, and thinking. To perceive a difference, one must have made a cut somewhere, at least the cut between figure and ground. And cuts that separate pieces presuppose space or time or both. Thus the cutting is part and parcel of our way of experiencing, and so are the differences we register and the relations we then construct among the pieces we have isolated. The world that we know—or try to know—cannot be a world we have not yet experienced, a world of which the mystics of all times have said that it is an uncut, seamless whole.

The "last question" I was talking about was, in fact, not an epistemological question but a question of ethics: How can we stop ourselves from segmenting our experiential world in ways that have begun to threaten life—life which, after all, is the necessary condition for all experience. Like Bateson, I believe that finding a way out of that dilemma requires the dismantling of "pathologies of epistemology" ; and, to me, the most pernicious among these pathologies is the belief that reason can tell us something about the ontological world.

*See G. Bateson, *Steps to an Ecology of Mind,* Ballantine Books, New York, 1972, pp. 478-487.

Aesthetics Is the Feeling Function

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It seems odd to think that Bateson's cybernetic epistemology, grounded in natural history, should at the end be revealed as fundamentally identical to Kant's, yet this seems to be David Shiner's claim in "Gregory Bateson and the Map-Territory Relationship". Shiner draws attention to a putative parallel between Bateson and Kant, claiming that the overall thrust of Bateson's work suggests the "territory" is in some sense a "thing-in-itself", an ontological domain beyond that to which a knower can have conscious access through his "maps". The question is how deep this parallel goes. My feeling is that it does not go as deep as Shiner would want.

To conceive maps as analogous to the Kantian phenomena raises difficulties, for phenomena do not arise through recursive construction, as do Batesonian maps. But more essentially, can one draw any fruitful distinctions between maps and territories at all? It is difficult to imagine what territory would correspond to maps of ordinary but complex human experience, like alienation or love or friendship, or any other identifiable moment emerging like a

standing wave from the flow of complex, multi-leveled, interpersonal interaction, apart from the map itself. Where is the anger that causes divorce, or the empathic understanding that becomes compassion? For occasions such as these, dependent ontologically on the construction of the cognizer, ephemeral, open to constant revision, and sometimes repudiated as totally mistaken; for such phenomena, what existence can they have except their moment-by-moment representation in someone's cognitive map?

No, it seems to me that Shiner has overstated his case, though in so doing, he has helped to bring to our attention an aspect of Bateson's thought that may be commonly overlooked. He is correct in pointing out that the overall thrust of Bateson's work differs from that of von Glasersfeld and Maturana (though I believe that at St. Benedict's, both Maturana and von Glasersfeld tried to indicate that what they were presenting followed the spirit of Bateson's work, not its letter). Yet the difference between them is not in their epistemologies, which are substantively the same, as in the intended scope of their overall philosophies. I would argue that there is a nontrivial affinity between Kant and Bateson in their pursuit of ontology, which differentiates their work from von Glasersfeld's and Maturana's more strictly epistemological concerns. At the same time though, Kant, in seeking to ground his epistemology and his ontology in a transcendent critique of experience, both preserves a version of Cartesian dualism and subordinates human biology to a minor, even irrelevant, role in the task of acquiring knowledge, and thus fundamental differences between Bateson and Kant remain. Let me try to make this argument clearer.

Kant offers in *Critique of Pure Reason* an analysis of the ways of encountering the world distinctive of the human mind, without which experience would not be possible. He finds the schema of space and time, the categories of understanding (including causality), and the fact that our experience is unified as we experience it (the "transcendental unity of apperception") as *a* priori structures, prior to and constitutive of experience. They collectively generate what we call experience from the unformed sensory manifold; at the same time, they themselves are static, unchanging over time.

Such a perspective is problematic if we take biology and psychology seriously, as do Bateson, von Glasersfeld, and Maturana. Even if we begin with the Kantian insight that in some way the knower's cognitive structures give shape and form to experience, we still must consider if those structures themselves are in any way modified as a result of ontogenetic or phylogenetic experience.

Moreover, such modification as they may undergo cannot be conceived mechanistically, the way a glass pitcher is modified as a result of encountering a stone, but cybernetically, as a flexible accommodation to perturbation. That is, the cognitive system retains its integrity as it responds to disequilibration. The fundamental question of the human sciences might well be how systems of this sort—biological and cognitive, but also social—maintain a self-identical integrity, as such, while simultaneously sustaining an open relation to their respective media. This is not a question about a conscious personal identity. It is a question of how it is that through exchanging nutrients, ideas, or patterns of behavior (as the case may be), systems cohere and re-generate themselves in a relationship of continuing viability to their environmental surround. There is a quality of what I would call "embeddedness" in this relationship that must be addressed.

If we agree, then, that Kant's critical insight needs to be revised through a genetic/developmental/historical perspective (as you wish), we are left with the problem of knowing in what way to make sense of the "environment" within which such knowing takes place. Clearly, a simple objectivist conception of the environment as a surround of climate, terrain, flora, and fauna, all as givens, will not suffice. And what is to be gained by holding on to a placemarker for the surround, re-named "territory" or "thing-in-itself"? Shouldn't we truly wipe the objectivist slate clean by

eliminating all ontological presuppositions? Von Glasersfeld and Maturana, it seems to me, take this route, seeking to affirm only that which emerges as a consequence of their respective epistemologies, and thus understanding ontology as perennially bracketed by epistemology.

As essential as I believe this approach to be, I feel that both von Glasersfeld and Maturana underestimate the need for clarifying the domain within which epistemologies themselves are viable. That is, both are consistently Kantian in recognizing that the noumenon is a limiting condition for epistemology, the boundary that demarcates precisely that which we cannot talk about. At the same time, my sense of their reading of the relation of the cognizer to its medium is one of co-existence, not embeddedness. For instance, von Glasersfeld argues in a representative article, published in 1982, that

> To say that the object—and here this refers to the "ontic" object or ontological reality in general—*permits* the operations the subject carries out, is an elegant way of saying that, in a given context, the object, the environment, the 'reality' in which the acting subject is embedded, does not hinder or prevent the subject's actions, and it is this absence of obstacle or constraint that makes the action viable. (1)

In a similar vein at St. Benedict's, Maturana discussed the ongoing interactive dance between organism and "environment" as "ontogenetic structural drift", in which an organism maintains conservation of correspondence with the medium, which is also changing. (2)

My problem with these conceptualizations is that they fail to acknowledge the role of "ontological reality" in sustaining action. It is true that the absence of constraint, or of ontogenetic drift, permits action to be viable, but viability, especially for subjects that have a natural history and even more for those that have a social history, is more complex than simple permissibility. Rather, it reflects, first, guidelines incorporated within an extant phylogenetic line, a "species wisdom" that, as in Waddington's model of embryological development through an epigenetic landscape, sustains action without determining it. And, second, it reflects the fact that for humans especially, though not exclusively, ontogenetic structural drift is sustained by the array of practices culturally developed and enacted in particular, historical and material circumstances. This twofold support, I think, is what Bateson is pointing at when he speaks of *relevance.*

> Context and relevance must be characteristic not only of all so-called behavior (those stories which are projected out into "action"), but also of all those internal stories, the sequences of the building up of the sea anemone. Its embryology must be somehow made of the stuff of stories. And behind that, again, the evolutionary process through millions of generations whereby the sea anemone, like you and like me, came to be—that process, too, must be of the stuff of stories. There must be relevance in every step of phylogeny and among the steps. (3)

In focussing so completely on the epistemology of knower, it seems to me that von Glasersfeld and Maturana sacrifice a legitimate concern for ontology as such, a concern Kant and Bateson share. To recognize the claim of ontology does not mean failing to acknowledge that our suppositions about it are bounded by epistemology. At the same time, though, it is to ground a human experience of connectedness at all levels with that which transcends knowing. My point is that we are enjoined not merely to describe the fact of embeddedness or recognize system integrity within embeddedness, but to understand embeddedness as itself a condition of integrity. In Batesonian rhetoric, embeddedness is a necessary component of the pattern that connects. And it is here that we may

return to Kant. Kant tries to preserve this sense of connection by thinking beyond pure reason to the reason that governs activity in the world, practical reason.

In *Critique of Pure Reason,* Kant establishes a deterministic causal framework for what we can know within the realm of nature. Insofar as humans and their ways of knowing are phenomenal, we too are subject to the constraints of such a framework. But Kant goes on to argue in *Critique of Practical Reason* that we are also noumenal, that through our everyday experience of freely chosen obedience to moral obligations, we exist at least in part beyond the limits of causality. Even if we cannot explain or begin to understand the noumenon, in some sense, we are i t. What is a limit epistemologically is our very being ontologically. And in his third critique, the *Critique of Judgment,* Kant tries to resolve this apparent paradox between knowing and being by finding in our experience of what he calls the aesthetic judgment a connection between the phenomenal and the noumenal. Such judgment combines "the reciprocal activity of the imagination in its *freedom* and the understanding with its *conformity* to law". Such a capacity, he goes on to say, "must therefore rest on a feeling" (4), on a mode of experience that goes beyond reason alone that, for Kant, is crystallized in the experience of the sublime. The sublime implies awesome beauty, a beauty that were it apprehended only by reason would terrify rather than inspire.

Bateson developed his thinking out of concerns and insights very different than those of Kant, yet I see them unexpectedly converging. Bateson, like Kant, associates with the aesthetic the intuition that beyond objectivizing epistemology *per se* there is a domain of experience which we ignore at our peril, which is foundational for our ethics and our experience of connectedness with the creation: "By *aesthetic,* I mean responsive to the *pattern which* connects... I hold to the presupposition that our loss of the sense of aesthetic unity was, quite simply, an epistemological mistake." (5) Beyond Maturana and von Glasersfeld, what we are here being told is precisely that we *should* affirm, even seek out, constraints. The failure to consciously do so is an epistemological error that can only result in some version of the arrogant insanity with which we have become so familiar in the 20th century, the species of alienation from self which Conrad's Marlow discerns in Kurtz as he observes, His intelligence was perfectly clear... but his soul was mad." (6) As both Kant and Bateson knew, we ignore ontology at our peril.

(1) E. von Glasersfeld, "An Interpretation of Piaget's Constructivism", *Revue Internationale de Philosophie* (142-143), 1982, pp. 616-617.

(2) Remarks paraphrased from Humberto Maturana's "A Biology of Cognition" address delivered at "The Pattern Which Connects: A Symposium on the Questions of Gregory Bateson", College of St. Benedict, St. Joseph, Minnesota, May 6, 1985.

(3) G. Bateson, *Mind and Nature: A Necessary Unity,* E.P. Dutton, New York, 1979, p. 14.

(4) I. Kant, *Critique of Judgment,* Hafner Press, New York, 1951, p. 129.

(5) G. Bateson, *Mind and Nature: A Necessary Unity,* E.P. Dutton, New York, 1979, pp. 8, 18.

(6) J. Conrad, *Heart of Darkness and The Secret Sharer,* edited by F. Walker, Bantam Books, New York, 1969, pp. 112-113.

Mapping

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David Shiner's thoughtful notes on Gregory Bateson and the map-territory relationship pose problems of interpretation which are indeed difficult to resolve. But the categories of his argument—

especially drawing similarities between Kant and Bateson—lead into very murky waters. Shiner argues that Bateson's position on the map-territory relation is similar to that of modern-day Kantianism. Shiner compares favourably the position of Bateson to that of Bateson interpreters such as Humberto Maturana, Ernst von Glasersfeld, and others who pose the map-territory relation in terms which "bear striking resemblance to the reconstructions of Kant by the German idealists of the 19th century".

I have great difficulty pigeon-holing Bateson as Kantian or neo-Kantian. The more usual attributions I see in the literature refer to Bateson as "Hegelian" and crudely represent Bateson's concept of mind as an example of pan-Hegelianism. (1) I also have difficulty in classifying Maturana and von Glasersfeld as "German idealists", but for different reasons. The following note will explain both objections, though I will concentrate my discussion on the first of these.

While close inspection of Bateson's writing gives hints here and there to Kant, and to neo-Platonism, Bateson was remarkably untouched by German philosophy. His major German inspiration was psychological, rather than philosophical. C.G. Jung was one source of inspiration, as was a coterie of Americans who developed Binswanger's writings on existential psychotherapy. By contrast, Bateson made continual references to English philosophers such as Berkeley, Samuel Butler, Russell and Whitehead, and —above all—to the philosopher, poet, and engraver, William Blake. I will expand below on the significance of Blake. Here I simply wish to point out that on the questions of mind, of mapping, and of "reality as we know it", Bateson was dealing with an English rather than a German tradition.

The English tradition in Bateson's work goes far beyond issues of philosophical idealism. It is important to recognize that Bateson always matched issues of "mind" in the philosophical sense to concomitant issues in evolutionary biology. As with most aspects of Bateson's work we find a "double description" as to what he is about.

The double description, he asserts, always gives greater dimensions to the problem at issue than a monological argument. Thus one line of argument hacks at the overgrowth of false materialism in explanations of evolution. Bateson broaches the very question which Charles Darwin so deliberately backed away from: if consciousness is a phenomenon of evolution, then the properties of natural selection must include and be coincident with the evolution of intelligence and consciousness.

I would maintain that Bateson's other line of argument, a "philosophy of mind", is contextual rather than contentful. Here Bateson is less interested in the *philo*sophical *distinction* between map and territory, than in the *pragmatics* of the *relation* map-territory. As with any writer who concerns himself with pragmatics, the question "how?" predominates over the question "why?". The pragmatic context of Bateson's interest in idealism is virtually self-evident. It would have been extremely difficult for him otherwise to have linked a concern with evolutionary biology to conventional semantic interpretations of mind, whether "idealist" or "realist".

Now Shiner is concerned with the problem: In Bateson's work are maps of differences "ultimately grounded by the notion of territory, or *ding, an sick",* or are they simply maps of maps of maps? In German philosophy there is a large historical leap between one interpretation and the other, Shiner states. He goes on:

> For Bateson as well as Kant, the conception of "territory" is an inseparable correlate of the idea of "map". The "map"... is that which appears to us and which we help to create; "territory"... represents the idea of the "thing" apart from its appearance—thus, "thing-in-itself". We do not perceive this "thing-in-itself", but the very conception of it necessarily accompanies our idea of the part or parts which we do perceive . (2)

The crux of Shiner's argument is that if we deny the winds of reality" (a term which Bateson himself uses), we become radical subjectivists and epistemological relativists, a position which both Kant and Bateson took great pains to avoid.

Shiner's attempt to discuss map-territory through the medium of Kant's "phenomenon-noumenon" contorts one vital point. Kant, neo-Kantians, and 19th century German idealists all evoked arguments in terms of dualisms, apparent or real. Bateson, on the other hand, took an epistemological position that avoided entirely Germanic forms of philosophical dualism.

Bateson chose not only to recontextualize the whole discussion in terms of pragmatics, but chose a methodology alien to the Germanic tradition. He could, for example, have made much more use of Jungian methods. But he did not. Instead Bateson used a method of logic first elaborated by William Blake. This method can appropriately be labelled as *English dialectics,* to distinguish it from its Germanic form, characterised in Hegel and Marx. Ironically, if Bateson had resorted to the German tradition, few would have raised the charge of "mysticism" against him; at the same time, a recourse to dualism would have jettisoned his whole intellectual project. The guiding presence of Bateson's "double description" is precisely that it is dialectical without being dualistic; second, that Bateson's dialectic has a *living basis* in *nature.*

Here once again, it is necessary to part Bateson firmly from Kantianism, neo-Kantianism, or neo-Platonism. In most modern European philosophy nature does not exist, and on this account its "realism" is as abstract as its "idealism". Even Karl Marx and Friedrich Engels, who went so far in overcoming these abstractions of philosophy by incorporating dialectics into the movement of history and society, had to co-opt Darwin's *The Origin of Species* in an attempt to assert the living basis of their dialectics. As Marx and Engels acknowledged, Darwin's materialism matched their own materialist explanations of the movement of history. For many materialists this co-optation of Darwin remains crucial in any attempt to link "culture" and "nature": for it enables the materialists to orchestrate arguments about historical forms of consciousness while rejecting the troublesome concept of mind. Soviet anthropology has been stuck with dialectical materialism as a context for the interpretation of human social evolution ever since—and with rather scanty results. (3)

A full analysis of Blake's dialectical method is clearly impossible here. A few pointers may help the argument. Consider Blake's lines:

> There is a Negation, and there is a Contrary
> That Negation must be destroyed to redeem the Contraries
> The Negation is the Spectre; the reasoning Power in Man (4)

and

> Negations are not Contraries: Contraries mutually exist
> But Negations exist Not... (5)

It is clear, even from these few lines, that Blake's dialectic is somewhat out of the ordinary. A logical category (negation) usually represented as a key term in the conduct of rational argument, and by implication, of the logical categories of mind, is dismissed as "the Spectre". Indeed, Blake makes clear that negation, as a dominant way of thinking, destroys mankind's potential. Blake argues that negation as a form of argument separates inherent qualities of an object and in so doing destroys the unity of the whole. Furthermore, because negation is abstract and static it produces a false version of qualities of an object, a version which it then proceeds to lodge in rational form. These rational forms, far from giving access to truth, manage only to set up barriers between qualities. The boundaries of objects become presented as duals, and no longer have any direct reference to the qualitative dimensions from which the logical dualism was abstracted. (6) In short, according to Blake, reason is not the universal quality

of mind. Nor is negation a universal mode of reasoning. Both are states "created to be annihilated".

It follows from Blake's objection to negation that Blakean dialectics cannot be characterised in the same terms as Hegelian or Marxist dialectics. For in the latter two cases, dialectical thought is equivalent to negative reason. In Blake, negative reason has to be distinguished from the notion of "contraries". While negative reason is a "state", a mode of explanation to be overcome, *contraries,* on the other hand, *exist.* They are qualities which living forms display and which are lodged in the minute particulars of nature. Real knowledge concerns itself only with these particulars and with their interrelations defined through the presence of contraries. The existence of contraries can enable differences and distinctions to be drawn, but recognition of contraries does not cleave a unity.

I would maintain that Bateson's arguments owe much to Blake's dialectics, and therefore they unite the existence of contraries in nature with the multiple interrelations of contraries in the pragmatics of human communication and thought. If anything, the final chapters of *Mind and Nat*ure are an attempt to utilize a fourfold dialectic which Bateson draws from Blake. But that is another story!

The map-territory relation must therefore be considered with primary reference to the interrelation of contraries which do not cleave a unity: the distinctions between mapping and "the winds of reality" are those of contraries within a unity. In the second place, because they are contraries within a unity, their distinction cannot be explained as dualisms. Thus map-territory relations cannot be explained in terms of internal relations *versus* external relations; perception *versus* cognition; sense and appearance *versus* imaginative construction. Instead each potential dual presents a starting point for annihilating the "state" which has given rise to them. Double description provides this interrelation of contrariety.

While the Kantian argument presented by Shiner does not lead directly into the lap of dualism, it remains precariously situated on one knee. Specifically, Kant relies upon the "field of sensibility" and percept to justify his classification of phenomena and noumena: "the concept of noumenon is thus a merely *limiting concept,* the function of which is to curb the pretensions of sensibility; and it is therefore only of negative employment". (7) Noumenon is a concept which negates the statement "all is phenomenon". But consider that Kant uses perception as an *instrument* of phenomena (conscious mapping). Blake took the line of at-tack that perception was a manifestation of a conscious-ness constructed in society and history. This is, of course, a familiar part of arguments by Marx and Engels. But Blake goes beyond this: sense-certainty and imagination are contraries, and because of this are inseparable.

Thus the "real" in all Blake's writing is not immediately given to the sense, but is a synthesis of the relation between sense-data and imaginative apprehension.

Such relations can include contexts in which "the truth of imagination is the opposite of sense-certainty". (8) Thus the key term for Blake, and one which is used repeatedly to characterize Bateson's own approach, is that of *imaginative vision.* (9) Imaginative vision synthesizes sense-data and imagination—not in some abstract dehumanised way, but in the pragmatic contexts of activity, communication, ritual, work, and the ordering of knowledge. *Taken as a perceptual process, imaginative vision is quite distinct from perception which gives dominance to sensibility and sense-certainty, for the latter leads to dualism.*

At this point it is possible to refer back to Maturana and von Glasersfeld. Both reject "instrumental" knowledge, for both understand that instrumental knowledge is a prelude and an accompaniment to control. Knowledge ordered according to negative reason; perception rank-ordered to award dominance to sense-certainty; biological explanation which allows no room for life to construct its own environment; intelligent activity which supposes all mental activity to be a type of information-processing -these are the paradigms of instrumental knowledge. When von Glasersfeld refers to "radical constructivism" or Maturana to the way in which the dance of human experience blinds sci-

ence because science refuses to recognize that we are observers "languaging", they are both refuting the pretensions of cognitive science which maintain that the external world can be grasped independent of an observer.

Neither trace their sources back to Blake. Maturana's lie in re-interpretation of his earlier work in cybernetics; von Glasersfeld is offering a modern interpretation of Vi Co. (10) There are, of course, differences of interpretation between them and Bateson, but I believe both share Bateson's conceptualization of imaginative vision. The differences centre around the mapping process. For Bateson the multiple relations between map and territory remained central to his thought. The relation map-territory was a unity, yet one which could only be understood through double, or multiple description. For Maturana and von Glasersfeld, the central interest seems to be in the recursiveness of map-making, and the conclusions about learning processes and knowledge which can be drawn from an understanding of recursiveness. This may lead to different emphases, but not to so radical a disjunction as Shiner alleges, that is Kantian realism versus radical subjectivism. (Epistemological relativism is another point entirely—one cannot be an anthropologist without it, and I utterly insist that Bateson was an anthropologist, therefore...)

The legacy of Bateson is his recursive vision, a vision which rejected instrumental thought. Today cognitive science proposes its own rules of recursion, but their recursions are singular, mechanistic, and represent external control. Blake, in one of his most famous lines, said:

"May God keep / From Single vision and Newton's sleep". I do not know whether Bateson in a dramatic moment evoked a deity to keep us all from the clutches of cognitive science. I can imagine that he did. More to the point, Bateson gave us an alternative framework for thinking about recursiveness, and I cannot suppose that there is a singular formula within this alternative vision.

At the conference to which Shiner refers, Maturana claimed only that Bateson's discourse enabled him to approach the question of coevolutionary drift, and to talk about this proposition within a field of "ecological thinking" which previously had not existed. He was not attempting to give an exact interpretation of Bateson's thought. Yes, he, Maturana, was more interested in the map than the territory, but he was attempting to pursue a concept of cognition which must eventually include the whole network of our participative co-interaction with the biosphere. In this, the process of map-making and the ramifications of participation, rather than observation, of the process must be a central concern.

(1) For the charge against Bateson of pan-Hegelianism, see J. Friedmann, "Hegelian Ecology: Between Rousseau and the World Spirit", in P.C. Burnham and R.F. Ellen, editors, *Social and Ecological Systems*, Academic Press, New York, 1979.

(2) D. Shiner, "Gregory Bateson and the Map-Territory Relationship", *Continuing the Conversation* (3), Winter 1985, p. 4.

(3) An interesting discussion of this phenomenon is by E. Gellner, *Thought and Change*, Weidenfeld and Nicholson, London, 1964. The noted French Marxist ecologist Vincent Labeyrie has defended Engels on this account and quoted Engels on the necessary harmony between the activities of humanity and nature, commenting:

The neglect of this connexion between man and nature has resulted in an education and specialization which is not backed by any overall view. This results in destructive and incoherent actions, each corresponding to a domain of science which is neatly labelled, neatly laid out and extremely narrow. Now the world is paying for this failure to understand the internal connexions, the unity of the biosphere... The concept of biosphere and of ecosystem underline the perenniality and evolution of our planet and its spatial objects and are an illustration of the dialectical materialist world view.

Cf. V. Labeyrie, "Ecological Models, Socio-Economic Organization and the Degradation of the Environment", manuscript in the author's personal files.

(4) W. Blake, *The Poetry and Prose,* edited by D.V. Erdman, Doubleday, Garden City, New York, 1965, p. 141.

(5) W. Blake, *The Poetry and Prose,* edited by D.V. Erdman, Doubleday, Garden City, New York, 1965, p. 160.

(6) D. Punter, *Blake, Hegel and Dialectic,* Editions Rodopi B.V., Amsterdam, 1982, pp. 120-121.

(7) I. Kant, *Critique of Pure Reason,* translated by N.K. Smith, Macmillan, London, 1933, p. 272.

(8) D. Punter, *Blake, Hegel and Dialectic,* Editions Rodopi B.V., Amsterdam, 1982, pp. 112 ff.

(9) See, for example, C. Wilder-Mott, "Rigor and Imagination", in C. Wilder-Mott and J.H. Weakland, editors, *Rigor & Imagination: Essays from the Legacy of Gregory Bateson,* Praeger, New York, 1981, pp. 5-42.

(10) E. von Glasersfeld, "An Introduction to Radical Constructivism", in Paul Watzlawick, editor, *The Invented Reality: How Do We Know What We Believe We Know? Contributions to Constructivism,* W.W. Norton, New York and London, 1984, pp. 17-40.

... and Back to David Shiner

Both letters which I have placed in the "summary reflections" category emphasize the importance of shunning "isms" and refusing to bind one's ideas to a particular school of thought. Both writers, Dr. Avery Johnson and Dr. Stephen Nachmanovitch, urge us to eschew pedantry as well as "isms" in our quest for wisdom. As Nachmanovitch observes, "... the various 'isms' have a basis in reality, and in the good intentions of those who propound them, but they quickly become mere words, or what he /Bateson/ called 'dormitive principles'." Sound Batesonian advice!

The two letters in the second category relate more directly to the content of my original article. In referring to the lectures by Dr. Humberto Maturana and Professor Ernst von Glasersfeld at the Bateson Symposium, I concluded that "If Maturana, von Glasersfeld, et al., are merely working on what the Bateson Symposium in Minnesota termed the questions of Gregory Bateson', then their work merits a good deal of praise. However, if they are claiming that their answers to those proposed by Bateson, they need to reconsider whether the maps they are drawing bear sufficient resemblance to the territory they are exploring." This was in fact the central point of my article: namely, that we should distinguish between working on Bateson's questions and setting forth the answers he has proposed.

Both men indicate that they are intending the former rather than the latter. Indeed, Maturana feels that the predilection that he and Bateson share for exploring similar questions is more "an expression of the times" than a conscious attempt on his part to emulate Bateson. He agrees with my view that his s epistemological position differs in essential characteristics from that of Kant as well as Bateson.

Von Glasersfeld's view is a bit different. He too sees himself as "trying to sort out a few points" with respect to the conception of epistemological problems which he shares with Bateson. However, he explicates Kant's position in a manner which bears directly on my article. According to von Glasersfeld, Kant "... never *denied* ontological reality..., but he made it very clear that, in his view, there was nothing we could rationally know or say about it." The correctness or otherwise of this proposition depends on how its author intends the word "nothing". With respect to the content of ontological reality, von Glasersfeld is correct: it is beyond the scope of our knowledge. With respect to whether there is any ontological reality, however, Kant's answer, like Bateson's,

is affirmative. There is, according to Kant and Bateson, "no-thing" %No can say about ontological reality, except that it is. When von Glasersfeld asserts that Our maps do reflect a territory, but a territory has to be... an arrangement of paths, of movements, and of actions we ourselves have made...", he seems to be denying this fundamental precept.

My concern with this aspect of von Glasersfeld's view is shared by the author of one of the substantive critiques of my article. Philip Lewin writes that "von Glasersfeld and Maturana sacrifice a legitimate concern for ontology as such, a concern Kant and Bateson share." Maturana denies the existence of *ding an sich,* while von Glasersfeld suspends belief in it. Both believe with Bateson that conventional epistemology leads to arrogance, in that the "subject", or "knower", expects that he or she knows "what really happens" in the world. This view is well worth refuting. In doing so, however, von Glasersfeld and Maturana throw the baby out with the bath water. As Lewin puts it, "both von Glasersfeld and Maturana underestimate the need for clarifying the domain within which epistemologies themselves are viable." The assumption of ontological reality, shared by Bateson and Kant, is vitally needed in order to ground a human experience of connectedness at all levels.

Lewin's article is itself an insightful contribution to the study of Bateson's ideas. The author is quite sensitive to the importance of the aesthetic dimension of epistemology as well as the role of biology and empirical psychology in adapting Kant's critical insight to Bateson's philosophical position. He overstates my estimation of the similarities between Kantian and Batesonian epistemology, particularly when he claims that I believe "that Bateson's cybernetic epistemology, grounded in natural history, should at the end be revealed as fundamentally identical to Kant's..." My strongest statement on the matter was to the effect that "Many aspects of Bateson's position may be characterized as modern-day Kantianism..." There are obvious differences between the Kantian and Batesonian philosophies; I was merely focusing on some of the similarities.

Dr. Peter Harries-Jones is also concerned that I have overstated the similarities between Bateson and Kant. He notes that Bateson is usually characterized more as an (unwitting?) disciple of Hegel than of Kant. However, he argues against both views, positing that Bateson "was remarkably untouched by German philosophy" and its dualistic philosophical perspective. He feels that Bateson's roots are rather to be found among Bateson's English predecessors, notably William Blake.

Harries-Jones' letter, like Lewin's, is an original contribution to the scholarship on Bateson's work. The debt of Bateson's logic to Blake's dialectics has been little explored to date, and Harries-Jones does a fine job of it. He sees Bateson's epistemology as being "dialectical without being dualistic", for Bateson's dialectic, like Blake's, "does not cleave a unity". This is intended to distinguish Bateson's position from that of the German philosophers.

Harries-Jones likens the relationship between map and territory to that between sense-certainty and imagination. Both contraries of each of these dialectics are unified by what the author calls "the imaginative vision", which renders them a unity rather than a duality.

Throughout the essay, Harries-Jones contrasts the above view with the dualistic scheme which he takes to be characteristic of German epistemology. He prefers the former on ethical as well as epistemological grounds, for he believes with Maturana and von Glasersfeld that "perception rank-ordered to award dominance to sense certainty" over imagination is not only arrogant but also "a prelude and accompaniment to control". Our goal must be participation rather than observation, co-evolution rather than lineal control.

In our concern for building an epistemology based on "the imaginative vision", one which denies the possibility of lineal control, Harries-Jones and I are in complete accord. However, I cannot see how Bateson's own words justify the non-dualistic

interpretation which Harries-Jones imputes to them. For example, he writes that the unity of the map-territory relationship in Bateson's work is "one which could only be understood through double, or multiple description." Bateson's view on this matter is as follows:

> ... it takes at least two somethings to create a difference... There is a profound and unanswerable question about the nature of those "at least two" things that between them generate the difference which becomes information by making a difference. Clearly each alone is—for the mind and perception—a non-entity, a non-being. Not different from being, and not different from non-being. An unknowable, a *Ding an sich,* a sound of one hand clapping.*

On my reading, this passage reaffirms Bateson's belief in the notion of ontological reality without allowing us any access to its contents. In this respect, it is similar to Kant's view on the matter.

It is certainly true, as Harries-Jones points out, that Bateson has an abiding concern for the insidious ramifications of conventional epistemological presuppositions. In attempting to rethink these presuppositions, however, he does not unify "map" and "territory" in the way which Harries-Jones suggests. (Perhaps he should, but this is another matter.) The unification of the map-territory relationship is located in the aesthetic realm, but along lines which Bateson shares with Kant rather than Blake. This is recognized by Lewin, who notes that "Bateson, like Kant, associates with the aesthetic the intuition that beyond objectivizing epistemology *per se* there is a domain of experience which we ignore at our peril, which is the foundation for our ethics and our experience of connectedness..." We cannot know *what* is, and to believe otherwise is arrogance itself; but if we further deny *that* it is (leaving "it" completely undefined), we no longer have any grounding for our experience. It is this grounding which Bateson considers to be, in Lewin's words, "a necessary component of the pattern that connects".

Enough. Let me conclude by again thanking those readers who so kindly responded to my initial article. Let me also thank you, the reader, for your time and effort. Working through these ideas is not easy, but I hope you believe, as I do, that doing so has its own rewards.

*G. Bateson, *Mind and Nature: A Necessary Unity,* E.P. Dutton, New York, 1979, pp. 68-69.

Mirror, Mirror on the *Ceiling*!

By Avery R. Johnson, Armory Rd., Milford, NH 03055. Copyright 1986 by Avery R. Johnson.

(Editor's Note: This is in response to the discussion of Bateson's "mirror paradox"—why does a mirror reverse left and right, but not up and down?—presented by Lion Goodman in *Continuing the Conversation* Number 4.)

Part of the hokum that the mirror mystery depends on is the fact that we so easily identify with the image of ourselves: we have seen it often and we commonly see other people in the same, upright orientation. Within that frame we are accustomed to knowing which is their left hand and which the right.

Ah, but take that mirror and slide it slowly up the wall—taking care always to keep yourself in view—until it is horizontal on the ceiling. What do you see? As you wiggle your left hand, there it is, still on the left. But—damn!—that person is *upside* down! Now there's no mistaking what has changed and what has not.

Erratum

In *Continuing the Conversation* Number 3, Ty Cashman was reported as asking Gregory Bateson what he was "really up to". Ty says that Bateson's answer was "I want to see that of the million / not thousand, as originally reported/ who survive, twenty think right."

American Society for Cybernetics Videotapes

Several videotapes made at the 1986 American Society for Cybernetics Meeting, "Conversations in Cybernetics", are available from Andrea Maloney-Schara, 3216 N. Pershing Dr., Arlington, VA 22201. Andrea is also selling a videotape made at the 1984 ASC Meeting, titled "Bateson's Cybernetics", with Heinz von Foerster and Rodney Donaldson, in which excerpts from Bateson's writings are read by Donaldson. Write for pricing information; all tapes are in V.H.S. format. Profits from the sale of these tapes go to the American Society for Cybernetics.

Perusing the Publications

A selection from recent articles and books related to the ideas of Gregory Bateson.

Kenneth Cauthen, "Imaging the Future: New Visions and New Responsibilities", *Zygon* 20(3), September 1985, 321339. A Christian theologian who lists Bateson's *Steps to an Ecology of Mind* as "particularly influential" on his own thinking grapples with a "new vision" of organic systems at the global, national, institutional, and personal levels. "Key words are holistic, unitary, synergy, harmony, cooperation, and synthesis." (p. 323) "Theology is seen as contextual and situational. It focuses on the predicament and hope of a particular group of people in a given situation in a specific time and place." (p. 332)

"... the favored paradigm may not become dominant or even pervasive... It is asserted that the vision elaborated (itself complex and multiform) is desirable whether or not it is ever dominant. The appeal is that those who agree with this assessment should see themselves as midwives of this vision." (p. 338)

Jacqueline Cramer and Wolfgang van den Daele, "Is Ecology an 'Alternative' Natural Science?", *Synthese* 65, 1985, 347-375. "The criticism of modern science refers to a clear image: the Cartesian ideal of positive, objective science as it is exemplified in classical mechanics. The image to which ideas of a nonalienating, alternative science refer is less clear. We may construct it from the visions of science advanced by social movements. Such visions stress harmony with nature rather than control over nature. They consider communication rather than exploitation to be the basic concept of our interaction with nature. They demand that scientific theories and methods reflect the esthetic and moral meaning of natural objects as well as the sense of responsibility we feel for them. They also oppose the fragmentation of knowledge into specialized disciplines..." (p. 348) "The question we address in this paper is whether in ecology the conceptual and methodological changes in science culminate in a transformation of science in the dimension of the 'value relations of knowledge'." (p. 352) "The issue under investigation here is... whether 'health' is a theoretical concept of ecology in general." (p. 359) "What is built into the very structure of ecological knowledge is a more complex notion of the control of nature. A transcendental commitment to control, a technological image of the man-nature relationship, underlies modern science in general. This commitment may be considered a normative element in the concept of objective knowledge. However, it is implied in the very meaning of 'objectivity' and does not differentiate ecology from physics. Ecology is specific in that it suggests a reflexive and systemic technological attitude towards nature... This transcendental commitment seems to be the closest ecology comes to the expectation that it provides a new integration of objective knowledge and social norms and values." (p. 370)

E.L. Cerroni-Long, "Style and the Study of Culture", ETC. 42, 1985, 125-132. Style as a *metacommunicational* de*vice* expressing redundancy and thus aiding communicative efficiency. "... style is not a code, or an aspect of a code, or the effect of the use of a code. Style is the formal arrangement of the code. In other words, thinking of culture in terms of style should lead to the recognition that culture is not a code in itself. Rather, it is a *system* of *relations* among a variety of codes." (p. 130)

Daniel Goleman, *Vital Lies, Simple Truths: The Psychology of Self-Deception*, Simon and Schuster, New York, 1985. Goleman begins this book with an account of his visit with Gregory Bateson in 1978:

"What," I asked, "is the 'pattern which connects'?"

"The pattern which connects," said he, "is a 'metapattern', a pattern of patterns. More often than not, we fail to see it. With the exception of music, we have been trained to think of patterns as fixed affairs. The truth is that the right way to begin to think about the pattern which connects is as a dance of interacting parts, secondarily pegged down by various sorts of physical limits and by habits, and by the naming of states and component entities." (p. 9)

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Coleman's concern is with perceptual/cognitive blind spots and how these can actually aid the "dance of patterns" in social systems, including individuals, families, and political organizations.

John W. Lowe, *The Dynamics of Apocalypse: A Systems Simulation of the Classic Maya Collapse,* University of New Mexico Press, Albuquerque, 1985. As a background to his own computer model for the dynamics of the "collapse" of Maya civilization, Lowe uses the ideas of several systems theorists to construct alternative model s. Bateson's "schismogenetic" (positive feedback) concepts are examined in one such model.

Deborah Schiffrin, "Conversational Coherence: The Role of Well", *Language* 61, 1985, 640-666. "Conversational coherence is a cooperative enterprise in which speaker and hearer jointly negotiate (a) a focus of attention—a referent—and (b) a response which further selects what aspect(s) of that referent will be attended to. Because not all potential referents can be attended to simultaneously, discourse markers like well help speakers locate themselves and their utterances in the on-going construction of discourse. Analysis of everyday talk shows that well anchors a speaker in a system of conversational exchange when the options which a prior referent has opened for upcoming coherence are not fully met." (p. 640) "... Bateson's point that one cannot see the outline of a conversation when one is in the middle of it, but only when it is finished, may also hold for the referent/response relation: one may not anticipate the range of coherence operations created by a referent until after the referent has received a response which has drawn on that range." (p. 660)

Trevor Williams, "A Science of Change and Complexity", *Futures* 17, 1985, 263-268. An overview of trends in "futures research" in the direction of "some broader science of complexity or change", following Bateson, Prigogine, et al. "One lesson... corroborated hypotheses which form the 'laws' of physics, chemistry or biology cannot be applied directly to human affairs... But once misconceptions of science are removed, intriguing analogies with economic, political, and social affairs may come readily to mind... More important is Bateson's enjoiner to become aware of the 'fundamentals' of science and philosophy be fore we tackle any study... If the study of management, and the awareness of the future necessary to inform that study, are based on 'fundamental' knowledge, it will not matter much whether an area of inquiry distinguished by the name 'futures research' survives or not." (p. 267)

Bateson Books Reviewed – Part 4

Readers are urged to send information on reviews not listed, especially reviews appearing in publications outside the U.S.

With a Daughter's Eye (1984):

Commonweal, April 5, 1985, 220.
Fusion, May-June 1985, 63.
Library Journal, August 1984, 1440.
Macleans, October 8, 1984, 59.
Ms., November 1984, 120.
Nation, October 27, 1984, 421.
Natural History, October 1984, 86.
New Republic, October 1, 1984, 34.
New York Review of Books, December 6, 1984, 3.
New York Times, September 29, 1985, 7:55.
New York Times Book Review, August 26, 1984, 1.
New York Times Book Review, February 24, 1985, 37.
New Yorker, October 15, 1984, 179.
Newsweek, August 27, 1984, 74.
Publishers Weekly, June 29, 1984, 92.
Science, September 7, 1984, 57.
Science '84, December 1984, 97.
Time, August 27, 1984, 57.

This listing of reviews of books by and about Gregory Bateson will be concluded in Issue Number 6.

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note:

After this issue went to press, dr. donaldson reported that the bateson archive at ucsc will not open until *fall* 1986. for additional information, contact him directly...

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Continuing the Conversation

A Newsletter on the Ideas of Gregory Bateson

Fall 1986   **Editor: Greg Williams**   NUMBER 6
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The Conversation *Expands*

At the suggestion of Dr. Laurence Richards, President of the American Society for Cybernetics, issues 6 and 7 of *Continuing the Conversation* are being sent to current members of the Society. These issues include items on ASC activities and contributions from ASC members to the "cybernetic conversation", broadly construed, as well as the regular Bateson-oriented articles. Depending upon ASC response to this two-issue experiment, *Continuing the Conversation* (perhaps re-subtitled "A Newsletter on the Ideas of Cybernetics") could become a regular feature of ASC communications.

Lest non-ASC subscribers get the impression that CC is abandoning the Bateson ship in some measure, I hasten to add that the current evolution of CC will not affect the "base level" of Bateson-related material in the newsletter. The idea is to provide, in *addition,* access to an *expanded conversation*—ideally, a conversation in which Gregory Bateson would have wished to participate. Thus, to an extent, CC is becoming more oriented toward *ideas that would* have *interested Bateson.* I believe that most readers should welcome the opportunity to put more emphasis on the conversation itself, with a bit, less emphasis on one of the conversationalists.

As always, participation is encouraged. I welcome comments, inquiries, critique, articles, illustrations, etc., particularly with regard to the new directions in which CC is heading. Deadline for submissions for issue 7 is December 1st.

ASC members who already subscribe to *Continuing the Conversation* will receive, at least, two extra "free" issues added to their subscription. Stay tuned for more information on the status of your subscription, should CC become more permanently allied with ASC. Anyone interested in becoming a member of ASC should write for information to: Dr. Laurence D. Richards, Department of Engineering Management, Old Dominion University, Norfolk, VA 23508.

(Almost) needless to say, the ideas and opinions expressed in *Continuing the Conversation* are not necessarily those of the American Society for Cybernetics.

A Conversation

Among Greg Bechle (R.F.D. 1, Box 113E, Northfield, MA 01360), Ty Cashman (P.O. Box 8129, Minneapolis, MN 55408), and John Dunne (c/o Greg Bechle). Copyright 1986 by Greg Bechle, Ty Cashman, and John Dunne.

(Ty Cashman: ...the occasion for this was a conference at U. of Mass. at Amherst, on "Is the Earth a Living Organism?" It was instigated and carried through by the Audubon Society Expedition Institute, and was unusual in the sense that the question was very different from the normal /in an/ academic conference, and the response was amazing. They asked a handful of speakers to address the topic, and after a brief period for word-of-mouth to occur, they were deluged with over 70 people who insisted on coming and giving talks... I was one of those uninvited who forced an invitation to speak and I spoke on "The Living Earth and Cybernetics of Self", which asked the question: How would anybody (or a whole civilization) ever come to the idea that the earth is not a living organism? and ended up showing what might have happened if Pierre Gassendi's "new paradigm" had been accepted instead of René Descartes'. It was out of the context of this paper, which Greg had listened to, that this conversation, back at his house, occurred. During the conversation, a couple of friends of his from the American Institute for Buddhist studies dropped in, John Dunne and Theresa Connolly. They sat listening for a bit and then John joined in. Theresa just listened.)

Greg: Our present ideas of evolution depend upon the idea that there is an organism and an environment that it adapts to. Or we can just say "environment" because adaptation may be seen as not adapting to something but rather staying inside of constraints so that one is not selected out. But from another point of view you can say that there is no organism separate from the environment. If that idea is extended to its limits, then it becomes problematic as to what actually evolves.

Ty: Right.

Greg: Because in this way of viewing things there are no things evolving in relation to other things, and we again come back to the dualism inherent in Bateson's stuff, the dualism between pattern and thing.

Ty: Right.

Greg: So in the above formulation we are left with pattern, but I still see pattern as a thing.

Ty: Yeah.

Greg: What do we do with some of this epistemological muddle? Or do you think I've formulated the question clearly? What's a better formulation of it?

Ty: There was a better formulation in which it became very clear that adaptation was supposed to be something that occurs in relation to something to be adapted to. Greg: Right.

Ty: And what is there to be adapted to, which this thing, this adaptation, this organism is trying to adapt to or the species adapt to? At one epistemological level it is a very interesting question because if you go to a radical constructivist point of view you get to the point where the map is the territory, at which point you are not adapting to anything except perhaps the coherence of your own mental states. However, you can look at an ecosystem in almost exactly that form—the ecosystem is like a grid in which adaptation is happening mutually.

Greg: Right.

Ty: In fact, it is happening in this conversation. Greg: It's happening.

Ty: You are adapting to me, and I'm adapting to you. I'm speaking and you nod, and when you nod that changes the way I speak.

Greg: Right.

Ty: And when I speak, it changes the way you want to nod and don't want to nod, and this mutual adaptation is going on in all conversations—and in a sense, evolution is like that, a conversation, opposed to a thinking in your own head—there is that otherness which creates the fullness of the loop. Now I think coevolution is this thing that is going on all the time. Even the rocks are changing. The grass changes and when the horses get heavier, their hooves get harder; the grass that they eat, if it is too soft and fragile, is deselected out, and other harder, harsher grasses naturally compete in because they are being beaten by the horses. The horse's stomach has

to evolve so that it can handle these harsher grasses that can stand the hoofprints of their weight. Ha!

Greg: So you may end up with big, big horses and palmtree-size grasses.

Ty: Right, and at that point it may have gone out of coherence.

Greg: Right.

Ty: So at that point it can't invent a stomach that can deal with the situation.

Greg: Tell me, if I can think of the question in another way—I'm thinking culturally—you and I and most people most of the time do still tend to think of evolution as some organism adapting to some pre-existing environment. The line is clearly made. It doesn't seem to be a both/ and thing where the organism and the environment are both interrelated and separate. It seems to be an either/or thing.

Ty: That's right. That's the Cartesian mind that we all have.

Greg: Hmmm—maybe we can switch and talk about this either/or problem as a real—maybe one of the deepest pathologies of the culture, and a little bit about what you mean by "double framing".

Ty: Oh yeah. Well, the double framing was an idea that came out to me when I was reading Descartes. And I realized that what he did was he had two unified worlds, absolutely unified, inside which everything could be explained in one way or another, but none of the explanatory principles in one of these worlds operated in the other at all. They were simply totally alien. And he fused these two and he called one spirit and the other matter. In fact what he called matter was an abstraction of what you and I think of as matter. It was denuded of all qualities except of extension.

Greg: So, there was no quality in that realm, it was all pure *quantity.*

Ty: All pure quantity.

Greg: The other realm was *quality.*

Ty: The other realm was qualitative and conscious and "ego".

Greg: And things like heart, and all that?

Ty: Right. It was all in there; but it was all under the name of ego. It was I—EGO—*"Ego cogito ergo ego sum".* Very, very strong on that point. Once having done that, once having clustered all of these in this knot, and having it be a substance which is entirely different from the substance of the material world, he put the two together and said, "Now this is the world". But in fact, he looked at the world through two frames, and it's almost like he had two filters—like he had an infrared filter, and he had a white light filter, and he looked through the infrared filter and saw only spirit, and with the white light filter he saw only matter. And he put these two together as if you could take a picture through both filters without the filters interfering with each other in any way. Now, you see, that's what I mean by double framing. There is no way these worlds can go together.

Greg: So, I think of it in terms of Venn diagrams. First he takes things—he takes the world, which is basically a big circle—he splits it up into two small circles that don't overlap, yet he is saying in a way that they obviously do overlap because they are components of this world, but he doesn't really give them credence—he doesn't allow them to re-fit in some way, I guess.

Ty: No. Yeah, he doesn't allow them. Having defined them that way, there is no way they can fit.

Greg: Right.

Ty: See, by definition they cannot fit together. He says, then, and just on his own authority, they do connect''. And the way he does that subterfuge is that he gives you a place where they connect. If you want to give people confidence that something is happening, tell them *where* it happens. That's very important. And so he says it happens in the pineal gland, in the center of the brain. That's where the soul actually connects with the body, but at no other locale. But of course the soul/spirit split has no locale.

Greg: Right.

Ty: Because it is not material, so where does it have a meeting?

Greg: Really! This is where the weak point is. The connection is extremely weak, and by looking at how weak this connection is, you could actually begin at that point to see how incorrect as an epistemological tool his pattern is. Maybe one of my problems is that I'm still lost in many respects in this Cartesian double frame simply because since the time I was an infant my whole culture has been lost in this frame. And, I think that you made the claim that this is one of the extreme dangers of the culture, one that is causing us a lot of suffering and problems.

Ty: I would say that exactly. And in fact it induces in us a schizophrenic way of looking at the world, because the double frame, though we don't notice it all of the time, is a kind of double bind. Our urge for coherence cannot ever be satisfied and so we go around with that kind of aborted desire for coherence that is never satisfied—because the situation is precisely a double message, in the schizophrenigenic way of having one message here and, in a larger frame, having it denied.

Greg: For example you said that Marxism comes from this in the sense that it is an attempt to get rid of the "spirit" stuff and say that the "material" stuff is real, but it seems that once you set up a split you oscillate between them, and historically, right now, we are oscillating in a schizoid way.

Ty: The desire for unity leads you to deny one of the frames. O.K. You've got unity, but you've lost everything that got loaded into that other frame.

Greg: Right.

Ty: And Romanticism and German Idealism all took the "spirit" side, and went off that *way.* "Screw matter, I don't want a double world." And they were right, they didn't want a double world.

Greg: And the Marxist historical materialists went the other way.

John: And that's where the scientific tradition falls, too.

Ty: And the scientific tradition ended up accepting the frame he made for science, but not accepting as substance the frame he made for the knower, the cognitive knower. However, it accepted this implicitly. It did not reject the spirit, it implicitly got it in there. It stays in there in the area of the assumption that the scientist can observe from the outside without interfering. Now that assumption is a ghostly hangover of the original idea. John: In other words, they did not so much reject the spirit part as they just ignored it.

Ty: They ignored it and they —

John: Therefore allowed it to stay there.

Ty: Exactly.

Greg: So again this seems to be the way out: people caught in this frame seem to deny one half of it. Through negation, through denial. "This does not exist." "This is not Real." "This is not important."

Ty: In the name of the desire for unity, the desire for coherence. Now, that's a perfectly legitimate desire.

Greg: Of course.

Ty: This is why the fault runs back to the original person who double-framed it. Because sooner or later, people are going to want coherence, and in doing that they are going to drop half the world. They are going to walk around with only half the world in their heads.

John: In a sense, the fault runs back further. The double frame is very similar to the subject/object dichotomy which in Buddhist thought is one of the manifestations of ignorance.

Ty: Quite so. It reaffirms that. In fact, by the very fact that Descartes aborted his meditations, did not push his methodic doubt as far as Gotama did, he left us... though using precisely the right method, but he stopped before the end. The illusion of ego he took to be the firmest, most real thing in the Universe. Now this is part of the double framing. Once you take something which is *known* by those who are deeply empirically investigating the thing (like the whole Buddhist tradition) as "an evanescent phenomenon"...

Greg and John: A construct.

Ty: A construct of some kind. If you take that to be the rock-hard point of undoubtable reality, then your double frame is very

serious. Very, very serious.

Greg: Why? Because it is so deeply wired into what you think you are as a being, and you will go to great lengths to defend it?

Ty: That's correct.

Greg: Because it is implicit in your very existence. To let go feels like dying.

Ty: You have given incredible grip to a particular form of ignorance by acknowledging it as the most real, solid, dependable, certain thing you can hold onto. "This is certitude." When you take an illusion and say, "This is certitude", that is a mind-bending thing. When the whole culture goes and does that—oh my God!

John: They call that in Tibetan *jigtsogtawa*, a "destructive view"—a view in which it is necessary to destroy the world in a sense in order to hold that view.

Ty: Exactly! Exactly! That's precisely it. Yes, it is necessary to—oh God that is a brilliant thing! And that's quite what happens. Because as soon as he did that the world died. Because he had to destroy it. He had to denude it of life, in order to hold that view. "Destructive view". You see, the logic of this stuff is so powerful. You can see logically if you hold this view you must destroy the world. There is no way to hold it against what you know by your experience to be true without destroying somehow your experience.

Greg: We were thinking of ways that in our language we keep reaffirming this Cartesian view. Once I said to a friend, You know, I think that there is little hope for this relationship". Then I thought, hey, that's interesting, because hope is not a matter of big or little. It's a qualitative thing—so what I'm doing is reducing the qualitative aspects of myself into a quantitative matrix. It seems that Cartesian dualism will necessarily make me do this, again and again. This kind of view causes pain. How do we untangle it?

John: Well, part of that is that linguistically in order to talk about hope it is necessary to objectify it, and therefore it becomes necessarily a part of that realm of objects which even in terms of the natural realm can be viewed in a certain sense as quantifiable. Even a mental object is quantifiable, so it is not only Cartesian—it is a kind of model you find outside of Cartesian dualism.

Ty: That's the interesting thing about the Cartesian thing: it emphasized a lot of the stuff you would naturally fall into and gave it a sense of reality and certitude, so you really couldn't get rid of it anymore.

John: What did he say about language? Did he ever really deal with that?

Ty: Language not so much. I came across the same thing in "deep ecology" when I was doing some writing on it. I found a whole critique: people are writing who are criticizing the whole thing—that humans are just another species in the ecosystem. We think of ourselves as of supreme importance, and that the world is naturally here for us, and it is correctly called "natural resources" and not something that is out of our web of life; the critique says "All beings have equal value". And I realized that the phrase "equal value" is just like "little hope". Ha! As if value is a quantity. Here's a quantity, here's a quantity; we fill them up equal. There is a great deal of anger and hatred that goes on around this—"I don't have equal value with a flea".

Greg: Right.

Ty: Well sure, as soon as you have double framed so that you can actually put "equal" and "value" in the same line, as if they were not two frames, then of course you will get very angry. It is a destructive view.

John: Therefore he codified it in a sense.

Ty: That's right, he codified it. You codify illusion as real, and oh boy!

Greg: And because of unique historical conditions that were existing at the time, it just spread through the culture and became the basis for a real mess.

Ty: There was a real hunger for a new frame, for a new system, and the person who gets in there first with the most really makes an imprint.

Metalogue on Mind

By Neill Kramer (74 Arvine Heights, Rochester, NY 14611). Copyright 1986 by Neill Kramer.

Did you ever notice, while walking down a familiar street or driving over the same road, that you spot something that has always been there but you weren't aware of it?

Why yes, so what of it?

Well, it's a curious thing... from the standpoint of physics, photons are being emitted from the entire landscape. But your eyes, for some reason, haven't noticed the "something" that has just now become perceived.

Why, do you think, our eyes haven't noticed the "something" before?

It could be that our unconscious processes of perception didn't pick up on that "something". In that case, our minds seem to determine physical reality.

What do you mean?

Well, physics determines the structure of the universe, as well as places limits on the structure of living systems. But physics can never determine to what our minds will pay attention. As I said, photons were coming from that "something" in the street that we never noticed.

So you are saying that mind is more important than matter?

Not exactly. What I am saying is that mind and matter are mysteriously intertwined. Yet we think that the physical world is out *there*, separate from mind, waiting for our objective description of its phenomena. We forget that our perception of that physical world is subjective. We unconsciously "choose" what we want to see. Of course, unconsciously choosing is a contradiction. Genetics may determine that human beings can see better in the day than at night. But *what* human beings see is only partly determined by genetics.

And the undetermined part of perception is governed by the mind.

Yes. But the mind is not a thing.

Now what do you mean by that? The mind is in the brain.

Well, not exactly. Let's take a broader view. The "something on the street that you didn't notice until recently. Was it part of your mind before you became aware of it?

No, of course not.

But once you saw it, it became part of your "awareness", part of your mental framework. But the thing itself never enters your brain; you just have an idea about the thing itself.

Yes, but perception takes place in the brain, does it not?

Of course. But let's say that "something" that you just noticed is an architectural ornament. That ornament never enters your brain. Your brain generates an image of that ornament, but what is this image? It is an idea. And where does the idea live? Is it in one neuron, or a series of neurons? This is the great mystery. Does the word "cat" live in one part of the brain, and if that part of the brain became damaged, would it never know what "cat" represented? Obviously, the mind/brain relationship is barely understood.

But you are still talking about the brain. That is where the mind is, even though we don't know *exactly* where it is.

Now hold on. Let's agree that we don't know exactly where the mind is. Perhaps it is of a "dimension" that includes brains and even genes, but isn't apparent except as a holistic phenomenon. In other words, we know we have minds, but once we look to the brain or inside a cell, we lose it.

Ah, so now you're throwing out the baby with the bathwater!

No, I'm going to include the baby, the bathwater, and the person

giving the baby the bath as one *system,* with mind and matter acting in some sort of synchronized dance. You see, I'm going to define mind as entirely relational. The word "cat" will never be found sitting on some axon somewhere, because "cat" is part of a process that included a mother and/or a father, perhaps a picture-book or a live cat, and a young child. The parent(s) repeated "cat" when the child pointed, the parent(s) asked where the "cat" was, the child pointed, the parent(s) smiled, the child smiled, and "cat" was that entire mental/physical phenomenon.

> So the mind is not in the brain; it is somehow part of a system.

Yes. And I would go so far as saying that a virus, when active, has mind. Even the simplest bacterial cell has thousands of genes. Of all life on earth, not one organism is organized by just one gene. Genes are relational; they are ordered in precise ways. This is a micro-system, as opposed to, but not radically different from, the system of the baby in the bathwater.

> So mind is relational and composed of complex processes. But a rock is relational, in that it is related to other rocks in a rock pile. Does it have mind?

I would say no, it does not have mind. A rock in a rock pile can have movement based upon a simple cause and effect relationship to other rocks. But mind as relational is always a function of circular or more complex chains of events. For a rock to have mind, it must be part of a system that senses difference. The rock would have to sense some change in the relationship between it and other rocks. And since we cannot observe the rock sensing such changes, we must conclude that the rock does not have mind. *But* if a *child were playing with rocks, sensing differences among different rocks, then* it *could* be *said that* the *rocks* are *part* of a *system that includes mind.* However, the rocks are not "thinking" or "sensing" subsystems within that system.

> So mind must involve some sort of sensing mechanism that goes beyond the simple cause and effect relationships of classical physics. But how is all of this related to spotting a new "something" while walking down the street?

Well, dogs have mind as they spot differences in smells; trees have mind as they detect differences in light and water; people spot differences in what they see, feel, touch, etc. These differences are not parts of the physical world. They are what minds do.

Living Ideas: Some Propositions

By Dr. Laurence J. Victor (Pima Community College, Downtown Campus, P.O. Box 5027, Tucson, AZ 85703). Copyright 1986 by Dr. Laurence J. Victor.

1. Cognitive systems and conceptual schemes, consisting of complex nested hierarchies and networks as represented in the structure of knowledge" are fully qualified to be viewed as being *alive,* in the new view of life emerging from the general systems perspective.

2. In the emergent sequence, cognitive systems and conceptual schemes emerge from the substrate of mind, as mind emerges from the substrate of brain systems and processes, as they in turn emerge from neurophysiological systems and processes, which in turn emerge from basic cellular and molecular systems and processes.

3. Components of conceptual schemes correspond to biological information processing systems. (I find it difficult expressing what I want to say. This is interesting, as to my conscious mind, the relationship seems quite clear and should easily be represented in verbal logic. Yet, it doesn't seem to be taking form. And, the word "correspond" no longer seems attached to any well specified domain of meaning, but has been set "afloat". Let me try to talk this one through: we have two domains of reality, first that of "mind",

in which conceptual schemes are systems, with components nesting from concepts to letters and phonemes, and second that of "brain", where the systems which "correspond" to components of conceptual schemes are information processing systems (here, the "brain" as a biological system is "defined" in terms of higher order logical processes—where has the "biological" gone?).

4. Cognitive systems, such as ideas and conceptual schemes, become *alive* when they develop "internal" homeostatic processes to preserve their own structure—when they become *more* than a "temporary standing wave" in the flow of information processing.

5. Cognitive systems *literally* grow, develop, evolve, transform, process information, and have "behaviors". They go through fission and fusion, propagate and differentiate, organize, and symbiotically unite. They sometimes even die within minds/brains. Cognitive systems have "lives of their own" as much as we "biologically" have "lives of our own".

6. In one metaphor, the brain is as a vast nested hierarchy/network of musical instruments and orchestras, capable of resonating in complex patterns with the complex patterns on the "sensorium" interacting with its environment and capable of resonating in complex patterns forming "internal" creative compositions. The mind, in this metaphor, is the whole system of potential and actual resonance patterns. The specific patterns which occur are cognitive systems and conceptual schemes. In a related metaphor, mind is to general language competencies as cognitive systems and conceptual systems are to literary passages and novels. Cognitive systems and conceptual schemes emerge from mind, they are not components of mind; just as literary passages and novels are not components of language.

7. Some ideas have very short lives, "passing through the mind/brain like meteors"—they resonate for a brief moment, then dissipate, leaving no record in long-term memory.

8. Nested hierarchies of systems are not themselves systems, but are entities "meta" to systems. "Life" is a global characteristic of *some* nested hierarchies of systems, related to a characteristic pattern of spatio-temporal feedback between the levels of the nested hierarchies. Levels in a living nested hierarchy are "alive" only in the sense that they are levels in a living nested hierarchy. The *term "living system"* does not *have* an on*tological referent.* Organelles, cells, organs, persons, and teams are not, in themselves, alive, but are alive in their relationships within nested hierarchies.

9. There is an important distinction between entities conventionally labelled as "mechanisms" and entities labelled as "organisms". Organisms are nested hierarchies which are alive. Organisms are not systems, and systems are not organisms. All "material" systems are *mechanisms;* their components relate to each other according to principles of physical causality (classically or statistically deterministic), and their behaviors are strictly determined by component parameters, initial states, and environmental interface conditions. For mechanisms, the substructure of components (downward into the nested hierarchy) is relevant only in determining component parameters. For organisms, the substructure of components (downward into the nested hierarchy) is often critically relevant to the nature of the organism, in terms of process, development, and evolution. (For example, the molecular structure of parts of a machine are relevant only as they determine the material parameters of its parts, such as strength, durability, weight, etc.—in many cases, either of two materials will suffice. But in organisms, changes in organelle functioning can have distinct effects on cellular, organ, and/or whole organism function; in turn, activity at a higher level in the nested hierarchy, such as meditation, can have effects many levels down in the hierarchy, such as sharp reductions in metabolic activities.)

Contemporary computers or electronic information processing systems are designed nested hierarchies of mechanisms which, as wholes, are not organisms. (Permit me to call them "nested mechanisms".) The relationship between levels in nested mechanisms is strictly reductionistic: only the levels immediately above and below a given level need be considered; this is (probably) not the case for organisms.

Mechanisms, simple or nested, can process information and learn. Organisms also can process information and learn.

Organisms can and usually do have mechanisms as components, and they can sometimes be made to temporarily simulate, or play the roles of, component mechanisms in nested mechanisms.

Only organisms can evolve, and then only in the sense of the coevolution of different system levels in the nested hierarchy. Just as single levels in an organism are not strictly "alive", neither can we say that single levels within organisms independently "evolve". Mechanisms, simple or nested, cannot evolve. The long-term changes in a star, in my terminology, are not "evolution", but rather multiphased development. Higher levels in all known organisms have emerged through evolutionary processes, meaning that all known organisms have evolved. Yet, since each level of an organism can be viewed as a system/mechanism, the question remains open as to whether we could *design* a living nested hierarchy or organism from, say, electronic components.

10. Information processors are nested mechanisms, in the strict sense that the output information is determined by the input information and the structure of the system at the time of processing. When organisms function strictly as information processors, they are simulating mechanisms.

11. "Intelligence" should refer to the multi-dimensional domain of competencies of a mechanism (simple or nested) or an organism to process information. Variables for "intelligence°" would relate to the type, complexity, quantity, and speed of information processed. Further, the multidimensional domain of competencies related to a mechanism's or an organism's capability to learn ("aptitude") should not be considered as "intelligence". "Aptitude" and "intelligence" are interdependent domains of variables.

12. All organisms are alive, and have some measure of intelligence and aptitude. Nested mechanisms, such as computers, can have high measures of intelligence and aptitude, but they are not alive.

13. Minds are higher emergent levels within organisms. No contemporary nested mechanisms have minds. (Possible exception: minds may be uniquely related to resonance; the basic feature of mind, in the biological substrate, is resonance, internally homeostatically maintained—in this sense, a swinging pendulum and a vibrating guitar string have low-level minds.)

14. For computers to have minds, they must have designed within them the capability of maintaining resonance through internal homeostasis. A test for the presence of mind in a computer would be systematic and creative changes in output with no new input. The contemporary model of the brain as a single, highly complex information processor from sensory input to behavioral output has no room for mind.

15. In minds, old information can re-organize in systematic and creative ways, even without further relevant input. Cognitive systems and conceptual schemes grow and develop "within" mind/brains, even with the emergence of new levels in the nested hierarchy of conceptual schemes. This growth and development of cognitive systems and conceptual schemes is influenced by sensory input, but it can occur virtually independently of new input, and at times in apparent conflict with input.

16. The theories of, for example, evolution, relativity, quantum physics, and democracy are *alive* in my mind/brain. The "knowable universe", as *simulated* in my mind/brain, is a "living zoo" of various "species" of concepts, cognitive systems, and conceptual schemes. "Life forces" are necessary to preserve these living representations of nested patterns abstracted from the (hypothetical) external universe.

17. Visions of alternative and potential futures can grow and develop from a small conceptual seed to an entire alternative world within a mind/brain. These potential worlds have material reality in the physical structures and processes of the neurophysiological substrate. When communicated, the ideas can take root and grow in other mind/brains. If enough mind/brain/bodies contain a new vision, their collective behavior may bring that vision to manifest reality. Since the basic structures of the society, first as the living vision in a mind/brain, then as a collective and communicated vision among mind/brains, and finally as "real" societal structures are *isomorphic,* we can say that new society has its origins in the mind/ brain, to grow and develop in the nested hierarchy called "humanity".

18. Because both mechanisms and organisms can learn, we have tended to apply training principles for programming mechanisms to the education of organisms. Organisms function as mechanisms when they are "conditioned". On the other hand, if concepts and conceptual schemes are truly alive, their growth, development, and evolution must be facilitated by methods quite different from those used in training and programming behaviors.

19. The growth and development of minds can best be accomplished when the minds are components of living social systems specifically designed to facilitate the learning of organisms. I propose that new educational systems emerge-through-design from the systematic and deliberate research and development la *learners* simultaneously organizing themselves into nested hierarchies of teams, learning communities, and learning societies.

A Letter

From Gail Raney Fleischaker (76 Porter St., Somerville, MA 02143). Copyright 1986 by Gail Raney Fleischaker.

I want to jump into the on-going discussion of the biological underpinnings of "thought" with a few remarks concerning an assumption which underlies any such discussion. I'll start with a few paragraphs locating my own interests in the matter, and then continue by stating the assumption and sketching out two of its consequences.

I'll close by brandishing a cautionary note.

Broadly, my intellectual interests are those questions raised in the conjunction of philosophy, biology, psychology, and systems theory. My central concern is the concept of "autopoiesis" and its use as it defines and identifies the operations of living systems, and the epistemology which would be the logical consequence of its application. In the course of a doctoral program in Philosophy of Biology I shall be writing a dissertation which will have autopoiesis and autopoietic systems as its central focus.

The dissertation proper will begin with a definition and discussion of the concept of autopoiesis and of living (autopoietic) systems as "operationally closed" systems. It will then elaborate the concept of autopoiesis as it applies to the historic origin of living systems and as it enables an integrated account for the evolution of complex biological systems. The account will hold that biological complexity is the product of the complementarity of structure and organization within living systems (and I shall champion a scheme of biological classification based on organizational complexity rather than morphological type). From such a view,

the rich diversity of life forms can be seen as the material record of a history of increasingly complex organization in biological systems. The evolution of that organization may result in the emergence of new properties at any level, and a new perceptual mode well may be the result of those new properties. Within such a general evolutionary account, "cognition" will be seen as an epiphenomenon of organizational complexity, one which emerges from within "perception" and is still intimately tied to it.

The dissertation will go on to distinguish living systems (organisms) from engineered systems (artefacts) and will point to the inherent contradictions in the application of "machine" language and metaphors to living systems. (If it doesn't too quickly make the dissertation 'a life's work", I would like to conclude it with a brief (?) discussion of philosophical constructivism—that view of the cognitive, psychological, and social worlds as "constructions of reality"—as the epistemological consequence of autopoiesis.)

It is evident that the discussion of biological evolution sketched here is based on the assumption that there is a continuity of biological phenomena in the physical world. That assumption logically entails two consequences for any general account of perception given within that discussion. The first may be seen in a horizontal cut through "perception" at any given evolutionary level, that is, in an examination of all modes of perception within a single species of organisms. The argument is that the *perceptual relationship* established between the organism and the physical world will be of the same logical type regardless of whether the mode is tactile, olfactory, visual, kinesthetic, acoustical, or gustatory. It is the entire organism which is found in a certain relationship with the world, and the various elements of its perceptual apparatus will have evolved as parallel parts of an integrated whole. This means that any overarching discussion of human perception which defines our visual relationship in the world in terms of "internal representations', for example, must do so for tactile and olfactory relationships as well, and for the same reasons. Each of the senses may be explained within separate theories, but those theories must themselves be consistent with each other and coherent within an account of perception as a general phenomenon. That is, the general perceptual account cannot posit explanations for the visual mode within a framework of "computational construction", for instance, and at the same time posit explanations for the acoustical mode within a framework of "direct realism".

The second entailed consequence may be seen in a vertical cut through the evolution of "perception", that is, in an examination of each perceptual mode in its phylogenetic development through different species of organisms. The argument here is that our definition of and explanation for any mode of perception in the human organism must be consistent with those for the same mode of perception in every other organism to whom we are related. We tend to think of our modes of perception as due nearly exclusively to higher cortical centers of the nervous system. Clearly, the development of the central nervous system has had everything to do with some peculiarly human variations on the perceptual theme. Yet to define perception as an exclusive property of an evolved central nervous system is to ignore our observations that other animals perceive, in any meaningful sense of that word, even as they may lack higher cortical centers. (It is traditionally taught, for example, that as an outgrowth of the brain, the vertebrate eye allows visual contact with the external world. In light of the full biological spectrum of visual perception, however, it would make more sense to argue that the brain is an outgrowth of the eye, an outgrowth which allows more and more specialized manipulation of the already-present visual sense.)

It would be argued, in sum, that the assumption of biological continuity throughout the natural world has the consequence of requiring, first, that the explanations we give of human perception must be consistent with our explanations of perception in all directly related biological organisms, and second, that the framework within which we explain the perceptual relationship

itself must hold equally across all perceptual modes.

I cast among the theories of perception currently taught: is there even one theory which meets the requirements sketched out here? The most promising candidate at first appeared to be the recent work of James J. Gibson, not only because of Gibson's insistence that the different senses operate as a unified system in an activity which is self-tuning (1), but also because of Gibson's emphasis on the-organism-in-perceptual-relationship (2). Gibson's "ecological theory" seemed both deep and wide enough to hold for all organisms, at whatever biological level, as well as for all senses. Alas, I was to be disappointed, and for reasons which prompt a note here of general precaution.

In constructing his recent theory of perception, Gibson committed himself to an ecological epistemological position. Yet the language of "information-based" perception which he used in setting forth that theory committed him to a very different position. Those two positions provide two mutually exclusive views of the universe -the Instrumental (or Interactional) view and the Objective view. Each view may be distinguished in its location of the perceptual source. In the Instrumental (Interactional) view, perception has an experiential source, that is, a source which is internal to the perceiving organism. Adopting the Instrumental (Interactional) view is the logical consequence of taking the ecological or naturalist position. The Objective view is the logical consequence of taking the dualist position, the foundation of traditional Western philosophy and psychology. In that view, perception is seen to have an ontological source, that is, a source which is external to the perceiving organism.

So, the cautionary note: We have become so heady with the successes of our contemporary computer age that we eagerly grasp models from their technical contexts and uncritically wind them up to run in altogether different settings. Gibson's adoption of a model from within "information theory" shows only that psychological theories in general, and theories of perception in particular, have not been immune to such piracy. But Gibson's theory of perception is only one instance. Any perceptual theory utilizing a perceiver-as-artifact model (e.g., the retinal-cortical system operating as would a lens camera, TV camera, video scanner, etc.) must necessarily generate a dualist universe: even if no internal representation is required (as in the video scanner model), the "input" or "signal source" is located outside the "machine". Indeed, the engineering vocabulary itself, perhaps most especially the word "information", carries with it the full philosophic burden of the dualist position, forcing the Objective view.

(Note: M. Zeleny, ed., *Autopoiesis: A Theory of Living Organization*, North Holland, New York, 1981 has presentations of "autopoiesis" by its sires and others, and includes an excellent introduction by the editor, who lays out basic concepts and terminology, provides an annotated bibliography, and refers to significant points of different interpretation by the volume's contributors.)

(1) J.J. Gibson, *The Senses Considered as Perceptual Systems*, Houghton-Mifflin, Boston, 1966.

(2) J.J. Gibson, *The Ecological Approach to Visual Perception*, Houghton-Mifflin, Boston, 1979.

CC: Boring and Disappointing

By Michael Luke Aitken (Box 172, Honaunau, HI 96726). Copyright 1956 by Michael Luke Aitken.

When I first learned of your newsletter through The *Utne Reader*, I was amazed and delighted. After a couple of issues of the reality of it, though, I'm bored and disappointed. It isn't so much (as David Shiner put it at the end of his response to others' responses to his initial article about what he thinks Bateson meant when he said...) that the ideas are so hard to wade through; I managed just fine reading Bateson himself—though I'll admit my mind suffered through

numerous growing pains in the process. No, the problem I have is not with the ideas, but with the incredible stuffiness of the analysts themselves, and their nitpicky combativeness.

These longwinded and heavy-handed attempts to fit Bateson's thinking to the various bodies of knowledge he touches so insightfully squeeze the juice right out of him, flatten his perspectives, circumscribe him in the sense that they talk all around him and leave him caged, an artifact poked and prodded by, but never really involved with and inspiring to their minds.

I find it very interesting to note that the two bright spots in your number 5 were both by Avery Johnson, that one of them shares my opinion (mine, dammit, mine!), and that they are both very very very brief. I realize that I shouldn't be coming down on you so hard on the basis of one issue, but number 4 wasn't all that great, and 5 was so much further in the wrong direction that I just had to speak up.

Finally, I'd like to mention that I'm not averse to the form of response to response to response; it can be wonderfully flexible and a lot of fun. And, after all, that's what a conversation is all about. But who wants to sponsor or participate in a dull conversation? What would a Batesonian cartoon look like? Aren't there any aspiring metalogists out there? As the deconstructionists point out, criticism is itself a creative process, and the responsible critic must maintain a dual focus (or recursive feedback loop). The objective observer mode is not only dull; it's also arrogant bullshit. Anyone who still thinks the creative process can be ignored by the reviewer or the critic should grow a beard and go off somewhere and mumble into it. It might help to realize that Bateson himself was very entertaining in his presentation of these concepts we're all chewing over, and that pattern is no less significant than any of the others—especially if you wish to maintain anyone's interest in what you want to say. The medium is also the message, yeah?

(Editor's note: The best possible answers to Michael's critique would be interesting contributions to the "conversation" which combine both rigor and imagination. How about it, readers?)

Upcoming Meetings

The Czechoslovak Medical Society J.E. Purkyně has announced an International Congress on Family Therapy, entitled "The Patterns Which Connect", to be held under the auspices of the World Federation for Mental Health in Prague, May 11th through 15th, 1987. According to the organizers, "the Congress will be devoted to the search for patterns which connect the work of family therapists of diverse orientations". The Congress language will be English. Participants are expected to include Mary Catherine Bateson, Lynn Hoffman, Carlos Sluzki, Karl Tomm, Carl Whitaker, and Lyman Wynne, among many others. For more information, write to Petr Boš, M.D., Czechoslovak Medical Society – ICFT 1987, Vit. února 31, P.O. Box 88, 120 26 Praha 2, CZECHOSLOVAKIA.

A Special European Conference of the American Society for Cybernetics is scheduled for March 15th through 19th, 1987, at the University of St. Gallen, St. Gallen, Switzerland. The theme of the Conference is "Design for Development of Social Systems". Dr. Gilbert Probst is coordinating the event; abstracts for paper presentations can be sent to him (address below). Abstracts should be about 500 words, with English as the official language. Papers will be clustered into common topic areas and scheduled at various times throughout the week. To cut down on parallel sessions and permit more plenary activities, panel discussions and symposia will be scheduled *by invitation.* Any suggestions for other innovative forms of interaction are solicited. This Conference is not intended to take the place of the Annual ASC Meeting, which is being scheduled for October 1987, in either Urbana or Chicago, Illinois; rather, it is an opportunity for those who have been active in ASC activities to meet and interact with their European counterparts. The Conference, then, is designed to be cozy and informal. The Conference will commence on the evening of Sunday, March 15th, and end on the afternoon of

Thursday, March 19th. Plans are underway to arrange a charter flight from the eastern U.S. direct to Zurich; this flight will probably leave on Friday night, March 13th, and return on Sunday morning, March 22nd, except for those who wish to purchase an add-on to stay longer. St. Gallen is a 30-minute train ride east of Zurich. Being a relatively small town, St. Gallen does not have large hotels, and it will not be possible for all attendees to stay in one hotel. However, there are sufficient hotels with rates ranging from U.S. $ 20 to $ 60 a night, all within walking distance of the University. The registration fee is U.S. $ 75 if received prior to February 15th, U.S. $ 85 after that date, and U.S. $ 30 for full-time students. The ASC has scholarship funds for those who would like to attend but do not have the financial means to do so. These funds are limited, and generally intended for students; however, anyone needing assistance is encouraged to apply. More details on the charter flight, hotels, and registration will be mailed out to ASC members soon. For additional information:

> Dr. Gilbert J.B. Probst (paper abstracts;
> University of St. Gallen local arrangements;
> Institut für Betriebswirtschaft general information)
> Dufourstrasse 48
> St. Gallen, SWITZERLAND 9000
> Phone: 41 71-23 35 72

> Dr. Laurence D. Richards (charter flight;
> Department of Engineering scholarships;
>   Management general information)
> Old Dominion University
> Norfolk, VA 23508

"Foundations of General System Science and Applications to Education" is the theme of the next Meeting of the International Society for General Systems Research (Canadian Division and Northeast U.S. Region), to be held at the Ryerson Polytechnical Institute, Toronto, Ontario, May 20th through 22nd, 1987. The Meeting is co-sponsored by the Faculty of Technology and the Office of Research & Innovation, Ryerson Polytechnical Institute, and the Center for Systems Research, University of Alberta. Papers must be received by January 31st. Send to H. Ken Burkhardt, Department of Physics, Ryerson Polytechnical Institute, 350 Victoria St., Toronto, Ontario, CANADA M5B 2K3. For more details, call Ken at (416)979-5000, extension 6976, or contact Dr. Richard Jung, Center for Systems Research, University of Alberta, Alberta, CANADA T6G 2H4, phone (403)432-8330.

Impressions of Recent Conferences

By Larry Richards (RFD #2, Box 152, Fairfield, ME 04937). Copyright 1986 by Larry Richards.

I attended three cybernetics-related conferences this past summer and would like to congratulate the organizers on what for me were very special events.

The first was the Gordon Research Conference on Cybernetics, held in Wolfeboro, New Hampshire. Co-chaired by Heinz von Foerster and Ernst von Glasersfeld, the theme of this Conference was "Cybernetics and Cognition". Approximately 100 people attended, including 25 from Europe. The next Gordon Research Conference on Cybernetics is scheduled for January 1988 in Santa Barbara, California. Ernst von Glasersfeld and Paul Pangaro are co-chairing the Conference. The tentative theme is "Cybernetics, Applied Epistemology". Suggestions and requests for information can be directed to Paul at Pangaro Incorporated, 800 3rd St., N.E., Washington, DC 20002; phone (202)547-7775.

The second conference was the Annual Meeting of the Control Systems Group, held at a retreat near Kenosha, Wisconsin, and organized by Bill and Mary Powers. The intensity of the conversations I experienced there far exceeded my expectations. This Group, of which about 25 attended the Meeting, appears to have

the potential for playing a key role in interactions within the cybernetic community. The ideas discussed at the Meeting were different from those I have heard elsewhere. I am currently editing a conversation I had with Bill Powers concerning the American Society for Cybernetics and the state of cybernetic inquiry in general, which I shall submit for publication in the next issue of *Continuing the Conversation.* (Editor's Note: CC #7 will he devoted in large part to an exploration of "Control Systems Theory", as developed by Bill Powers and others. This Theory has received somewhat insufficient treatment in the cybernetic literature, despite growing acknowledgement of its importance by leaders in the cybernetic community, apparently including Gregory Bateson. Contributions on all aspects of CST are hereby solicited for publication in CC #7. That issue will be sent to all members in the Control Systems Group, as well as to ASC members and "general" CC subscribers.) The next Meeting of the Control Systems Group is scheduled for September 23rd through 27th, 1987, at the same location as this year's Meeting. Contact: Bill Powers, 1138 Whitfield Rd., Northbrook, IL 60062.

The third conference was a mini-conference of the American Society for Cybernetics – Western Region, held at Santa Cruz, California. Organized by Elin Smith and others, the conference focused on visual/spatial language and organizational design, among other topics. The opening talk was given by Heinz von Foerster, and was entitled "The Future History of Cybernetics". This conference was attended by about 80 people. If anyone is interested in starting a local chapter of ASC or in organizing a mini-conference, I would be happy to provide administrative support.

Perusing the Publications

Some recent articles related to the ideas of Gregory Bateson and cybernetics.

Richard M. Coe, "It Takes Capital to Defeat Dracula: A New Rhetorical Essay", *College English* 48(3), March 1986, 231-242. *Dracula* as a paean to rationalism (of the nineteenth-century flavor, of course). The vampire, a being immersed in *analog* communication, vs. Van Helsing, "a doctor and lawyer, a scientist of iron nerve and icy temper, with indomitable resolution and self-command, clean-shaven, well-balanced, poised...", the archetype of the *digital* communicator. "... both Romantics and anti-Romantics like Stoker accept the Classical dichotomy 'reason/ imagination'—and accept it not only as a defining dichotomy but also as a *dichotomy* (i.e., as a pair of terms either of which may be defined as the opposite of the other). This binary dualism represents 'reason/imagination' as a *symmetrized opposition.* It thus reduces potential resolutions to conquest and control (or compromise) -neither of which is really a resolution... this kind of dichotomy is potentially pathological because it leads to paradox and thence to permanent oscillation. In this case, the oscillation manifests itself as a continual inversion and reinversion of the terms. A genuine resolution would have to be based on the de-symmetrizing of the dichotomy and its re-representation as a *dialectical* con*tradiction,* thesis and antithesis, i.e., a contradiction between two terms on distinct levels (perhaps oppressor and oppressed), not two 'sides' of the same logical type." (pp. 239-240) "The bourgeois Romantic exaltation of the analog... is a revolt against the real domination of the digital in bourgeois society... But the bourgeois Romantic image of *what should* be—usually, and significantly, based on *what was*—does not base its critique of existing reality on the potential of the historical period it is criticizing, on *what* is *possible.* That is why bourgeois Romanticism must falsify—i.e., "romanticize"—*what was* in order to equate the past with *what should* be... Once a dichotomy is validated, one choice is in the best interests of those who formulated the question... The Romantics are right, even empirically, when they assert the primacy of the analog. Within each hierarchical level, the analogic is the ground for the digital (and thus of a higher logical type). But the primacy of the analogic cannot be sensibly asserted so long as the underlying contradiction is represented as a symmetrical opposition and so long as primacy is associated with control (itself a

digital concept)... Thus the bourgeois Romantics' failure genuinely to reconceptualize the dichotomy against which they revolted set the stage for its reinversion in such texts as *Dracula."* (pp. 240-241)

Reed Way Dasenbrock, "Escaping the Squires' Double Bind in Books III and IV of *The Faerie Queene"*, *Studies in English Literature 1500-1900* 26(1), Winter 1986, 25-45.

Oh, the binds and paradoxes of Petrarchan love ("be bold; don't be too bold")! "Bateson's theory seems to me a striking parallel to Spenser's depiction of the double bind of Petrarchan love in Books III and IV of *The Faerie Queen.* The crucial point is that Bateson's analysis does not blame the schizophrenic child as much as it does the relationship, the social network or context, in which the child has been raised. In Books III and IV of *The Faerie Queen,* Spenser makes an analogous shift in attention from individuals to the relationships in which individuals are caught." (p. 32)

John Hannon, "Thine is the Power: An Epistemological Fable", *The Family Therapy Networker* 10(4), May-June 1986, 49-51. Jay Haley and Gregory Bateson in (direct) conversation with God and each other, with St. Peter, et al., listening behind a one-way cloud. The debate is about "power", of course, and God, in His (?) infinite wisdom, lets the discussion continue *ad infinitum.* Says God: "Debate until you reach a conclusion, and your conclusion will be the beginning of something new between you." The conversation continues...

Erik Larson, 'Alien Link', *OMNI* 8(12), September 1986, 28. A report on "Contact", an annual conference that brings science-fiction authors and anthropologists together to talk about "close encounters" with aliens. Part of each conference is the *Bateson Project,* in which teams create imaginary alien geographies, biologies, and cultures "in strict accordance with the laws of physics and the constants that make cultures work". Founder of Contact is James J. Funaro, an anthropologist at Cabrillo College, Aptos, California.

Andrew McLaughlin, "Images and Ethics of Nature", *Environmental Ethics* 7(4), Winter 1985, 293-319. A critique of the instrumental view of non-human nature. "The human interest in successful instrumental action cannot be impugned in *toto.* It is inconceivable to imagine what human life would be without purposeful action. We are vitally concerned with realizing goals through acting upon the world, and this aspect of life must be acknowledged. Necessary though this orientation to the world may be, the *exclusivity* which we accord it when we accept its implicit philosophy of nature is literally a mistake. Finding reward in acting on the world instrumentally, we may mis*take* the world revealed under that interest as the world. This is the epistemic error... Yet one should be suspicious of any claim to *demonstrate* the falsity of the instrumental image of nature. The problem is that such fundamental questions do not admit of any direct confrontation with unassailable fact... one could note that 'cybernetic circularity' is as much a metaphor as is the linear image of causality." (p. 302) "In a mechanical model, the elements of the model are taken as independent of each other. The state of the system in which they exist is understood as determined by the elements, plus the relations between those elements. Each element is taken to be what it is 'essentially' independent of its relations with other elements. That is, its relations are 'external', in that the relations it enters into are external to what the element 'really' is... In contrast, an ecological image takes the individual entity as nested within its environment, and takes the relations which a part has with its environment as *essential* in constituting what it is. In this sense, relations are 'internal' to the nature of the part. The parts are as they are because of the larger system within which they exist... The ecological image of nature... may be elaborated to include a transmuted instrumental orientation as a component." (pp. 311-312)

John Thomas Perceval, The Case of Dr. Peithman" (with an Introduction by Edward M. Podvoll), *Naropa Institute Journal of Psychology* 3, 1985, 109-141. John Perceval's account of his own "lunacy" has been edited by Gregory Bateson as *Perceval's Narrative* (Stanford University Press, 1961). Perceval devoted his later life

to reform of the asylums in England, and this document details his attempt to gain the release from Bethlehem Hospital of an individual committed there without proper examination.

As Podvoll notes in his introduction to Perceval's "petition", all the issues Perceval made his discoveries about are the same ones we face today... he had vividly witnessed the tender shoots of re-covery—his own and many others'—being trampled, and he felt that the ignorance of his culture about what was being done would lead to years of inhuman treatment and calculated abuse."

Robert Rogers, "Three Times True: Redundancy in Ambigu-ous Texts", *Poetics Today* 6(4), 1985, 591-605. If it is the function of redundancy—when redundancy is functional—to contribute to message clarity, as linguists understand the matter, and to counteract the distorting, confusing presence of noise, as com-munications engineers understand the matter, can redundancy be said to perform the function of counteracting ambiguity in poetic texts, which are by their very nature inherently ambiguous structures?" (p. 592) To answer this question, Rogers examines redundancy and ambiguity in "Ode on a Grecian Urn" by Keats. "So the poem is *both* redundant and ambiguous. That means it must be *both* determinate in various ways and indeterminate in others—as distinct from being *either* determinate or indetermi-nate... the systematic meaningfulness of a literary text does not depend on any particular generalization one might make about it any more than the pleasure of a stroll through the woods depends, synecdochically, on the representativeness of a single vista." (pp. 603-604)

William Irwin Thompson, "Pacific Shift: The Philosophical and Political Movement from the Atlantic to the Pacific", *Annals of Earth* 4(2), 1986, 5-8. An address to the International Transpersonal Association, Kyoto, Japan, April 1985. The transition from an industrial to an ecological world-view is expressed in the shift from the materialistic modes of thought as expressed in the phi-losophies of Adam Smith and Karl Marx to the re-visionings of the relationship between Mind and Nature as expressed in such thinkers of the Pacific Rim as Gregory Bateson and Keiji Nishitani. This philosophical and cultural movement is what I mean by the term Pacific Shift... The philosophy of Gregory Bateson is a good example of the Pacific Shift, for Bateson in his own lifetime made the transition from European thinking to the California world of cybernetics and Buddhism." (p. 5)

Michael White, "Negative Explanation, Restraint, and Double Description: A Template for Family Therapy", *Family Process* 25(2), June 1986, 169-184. "Cybernetic theory provides a nega-tive explanation of events in systems. According to this theory, events take their course because they are restrained from taking alternative courses...

From this perspective, habitual family interactions or the spe-cific behaviors of family members are best explained negatively by the analysis of different kinds of restraints." (p. 169) The receipt of news of difference is essential for the revelation of new responses, for the discovery of new solutions. Receipt of news of difference requires that family members perceive a contrast between two or multiple descriptions. The therapist contributes to the family's perception of such contrasts by working to develop double or multiple descriptions of certain events, standing these descrip-tions side by side for family members and then inviting them to draw distinctions between these descriptions." (p. 173)

Of Interest to ASC Members

ASC-related items for inclusion in the next issue of *Continuing the Conversation* can be sent directly to CC editor Greg Williams. Larry Richards will also be forwarding material to Greg prior to publication of CC #7. Of particular interest would be any corre-spondence that might stimulate conversation via this medium. Some editing of such letters may be necessary, with authors given an opportunity to respond. If ASC members approve, *Continuing the Conversation* could become a regular feature of ASC commu-nications in 1987. Please send your opinions to Larry Richards, RFD #2, Box 152, Fairfield, ME 04937, or call (804)440-3758.

The second issue of the magazine *Cybernetic* is in production and should be available within a month. A third issue is already being processed. Volunteers for editing future issues are being sought.

As the end of another calendar year approaches, the annual drive to renew memberships and encourage new members to join ASC will soon be in full swing. A brochure is being prepared which will contain membership information. Also, a packet of ma-terial is being put together to be sent to new members as soon as their applications are received (for 1987, all members will receive this packet). In addition to receiving *Continuing the Conversation* (or other newsletter), the ASC Postcard, and *Cybernetic* (when it appears), members will be able to choose one of the following journals: *Cybernetics and Systems* (journal of the Austrian Cyber-netic Society) or *Systems Research* (journal of the International Federation for Systems Research, of which ASC is a member). For those who would like both of these journals, significant reductions in subscription rates are available to ASC members. Also, Princelet Editions has agreed to make available to ASC members "little books" which contain interactions of nontraditional types. The Conference Books from the 1984 Philadelphia ASC Meeting and the 1986 Virginia Beach ASC Meeting are available in this format. Orders for these should be directed to Princelet Editions, Box 872, Champaign, IL 61820. Anyone interested in editing a "little book" can contact Annetta Pedretti at Princelet Editions. There will be

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more details on this forthcoming in the near future.

The following publications are available from Dr. Stuart Umpleby, Department of Management Science, George Washington University, Washington, DC 20052 (make checks payable to "American Society for Cybernetics"):

Cybernetics Bibliography, $ 5.00.

Cybernetics Glossary, $ 3.00.

Purposive *Systems* (Proceedings of the 1967 Conference , $ 4.00.

Cybernetics and the Management of Large Systems (Proceedings of the 1968 Conference), $ 4.00. *Cybernetics, Artificial Intelligence, and Ecology*

(Proceedings of the 1970 Conference), $ 4.00.

Cybernetics Techniques in Brain Research and the Educational Process (Proceedings of the 1971 Conference), $ 3.00.

"Modeling of Biological Systems" (Special Issue of the *Journal of Cybernetics and Information Science),* $ 5.00.

'Man-Machine Systems" (Special Issue of the *Journal of Cybernetics and Information Science),* $ 5.00.

Can You Think Like a Russian?

Vladimir Lefebvre, a Soviet emigre mathematician and psychologist, has written a book which contends that the ethical systems used in the United States and in the Soviet Union are fundamentally different. "Ethics" is a software package based on Lefebvre's theory; the program asks the user a series of questions about two other real or hypothetical people. On the basis of the user's answers to these questions, the program determines whether the user is applying the American or the Soviet ethics. Most Americans use the American ethical system. But how many Americans can answer the program's questions as would most Soviets? This program allows a person to practice "thinking like a Russian (or like an American)".

"Ethics" runs on IBM PC's or compatibles. The software was developed by Christina Gibbs and Stuart Umpleby at George Washington University during the summer of 1986, based on Vladimir Lefebvre's *Algebra of Conscience: A Comparative Analysis of western and Soviet Ethical Systems* (Reidel Publishing Co., 1982) To obtain a copy of the program, send $ 39 to Dr. Stuart Umpleby, Department of Management Science, George Washington University, Washington, DC 20052.

Contents of Back Issues of *Continuing the Conversation*

With this issue reaching so many new readers, it seems appropriate to publish information on the contents of previous issues of CC, for those interested in ordering back numbers (please use the form provided on page 9).

Number 1 (Summer 1985): Background on "The Pattern Which Connects" Symposium on the Questions of Gregory Bateson, held in May 1985 at the College of Saint Benedict in Minnesota, out of which came the impetus to publish CC.

Number 2 (Fall 1985): Essays on "transformation", Bateson and phenomenology, and Gaia-mind.

Number 3 (Winter 1985): "Words to Gregory Bateson" by Philip Stewart, "Steps to a New Consciousness" by James McNeley, and "Gregory Bateson and the Map-Territory Relationship" by David Shiner.

Number 4 (Spring 1986): "an epimetaparable" by Carol Wilder, "Wake Up and Go to Sleep!" by Elisabeth Thomas, "Words to Philip Stewart" by Janie Matrisciano, and a remembrance of Bateson at Naropa in 1975 by Lion Goodman.

Number 5 (Summer 1986): Notice of the opening of the Gregory Bateson Archive at the University of California, Santa Cruz, and responses to David Shiner's "Bateson and the Map-Territory Relationship" (in CC #3) from Avery Johnson, Stephen Nachmanovitch, Humberto Maturana, Ernst von Glasersfeld, Philip Lewin, and Peter Harries-Jones, with a rejoinder by David Shiner.

Explanation of Address Coding

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ASC members will receive at *least* issues #6 and #7. If you like CC, please let Larry Richards know. Thanks!

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Continuing the Conversation

A Newsletter on the
Ideas of Gregory Bateson

The Pattern of *Conversations* to Come

This special issue of *Continuing the Conversation,* on William Powers' Control Systems Theory, is the last to carry the subtitle "A Newsletter on the Ideas of Gregory Bateson." It appears that CC will become the "official" newsletter of the American Society for Cybernetics, at least for 1987, and so will be dealing with *somewhat broader* themes in cybernetics—*including* Bateson's ideas, of course. CC's broadened pattern is already evident in this issue—Bateson is rarely mentioned explicitly, though the subject matter includes much that held great importance for him: feedback models in biology (especially in human behavior); alternatives to "behaviorism," "rational maximization," and other lineal theories in the social sciences; hierarchical conceptions of adaptive systems; and even the importance of rigorous cross-disciplinary foundations for psychology, anthropology, economics, and politics. Here—and in issues to come—are conversations in which Bateson might want to participate, were he still alive. All those who appreciate Bateson's ideas are invited to join this ongoing "metalogue" in his spirit.

Members of ASC will automatically receive four issues of *Continuing the Conversation,* with "ASC NEWS" inserts, in 1987. For non-ASC subscribers, the price of CC will remain at $1.00 per issue. If you are an ASC member and subscribed independently to CC, you can write for a refund (though we'll put the extra money to good use!); otherwise, we'll credit you for additional issues should you ever decide to stop being an ASC member. And we'll give refunds to anyone interested only in Bateson who thinks CC is becoming too eclectic (though the best way to make sure that Bateson's ideas are prominent in CC is to submit articles about those ideas!).

For more information about the American Society for Cybernetics, contact Dr. Laurence D. Richards, President of ASC, Dept. of Engineering Management, Old Dominion University, Norfolk, VA 23508. The opinions expressed in *Continuing the Conversation* are not necessarily those of the American Society for Cybernetics.

Deadline for submissions to CC # 8 is March 1, 1987. Help keep the conversation going in this "Newsletter on the Ideas of Cybernetics." Thanks!

"Control Systems Theory"

William Treval Powers is a singular phenomenon: an independent investigator with no academic affiliation who, via his passionate commitment to the scientific explanation of organisms' behaviors, has conceived and developed a genuinely novel *foundational model* for psychology and ethology—indeed, for all of biology. Proper recognition of the utility of Powers' *Control Systems Theory* by academic social scientists has been slow in coming, although there have been recent indications that the bandwagon of CST supporters could soon become a trainload. CST was born in the Fifties, but it took a book *(Behavior: The Control of Perception)* and a *Science* article in 1973 (see "A Basic Bibliography of Control Systems Theory" in this issue of CC) to initiate much excitement. Today, CST is being used extended) by biologists, psychologists, economists, sociologists, and clinicians; a Control Systems Group has been founded, and Powers continues to write lucidly about his "life-long love," the cybernetics of human behavior.

Yet within the cybernetics community, it seems that CST has received relative neglect. Certainly, CST hasn't received the publicity and promotion that, say, "recursion" and "autopoeisis" have, even though CST's twin notions of *feedback control of perception by hierarchically arranged loops* both incorporate seminal ideas of cybernetics. This CC represents an attempt to bring CST a little closer to the foreground in contemporary cybernetic thinking. The articles herein *do not* constitute a tutorial on Control Systems Theory—see *Behavior: The Control of Perception* for that. They *do* show some of the broad range of applications of CST, they indicate some of the motivations for employing it, and they begin to suggest its extraordinary explanatory abilities. If a few readers become sufficiently interested in CST to explore it further, this issue will have served its purpose—*it will have achieved its goal!*

On Purpose

By W.T. Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1986 by W.T. Powers.

The concept of purpose has been in bad repute among life scientists since before they adopted that name. Control theory, on the other hand, shows that the principal property of organismic behavior is its purposiveness. There is clearly a problem of acceptance here, especially because anyone who speaks of purpose in polite scientific company is likely to detect a common reaction—oh, you're one of *those*. The difficulty is that the word purpose evokes images of mysticism and religious persecution, throwing the whole discussion into the wrong category. It's hard to persuade a scientist to take another look at the phenomenon when he or she is convinced that there isn't any phenomenon.

What is the phenomenon? It can be described very simply. We observe an organism in its natural habitat over some period of time. We see that it carries out typical behaviors again and again, maintaining itself in certain relationships with its environment and causing repeatable effects on its environment. It might seem at first that these regularities could be studied in the same way we learn about ocean currents, orbits, and crop yields: by finding the antecedent conditions that govern the observed behaviors. Actually this approach works very poorly; we are hard-pressed to find even statistical regularities. In trying to understand why behavior is so variable, we look closely at the details, and find a puzzle. While the general outcomes of behavior often repeat well enough for us to study them, the actions that bring about these outcomes vary almost at random. There's a kink in the causal chain.

One way to eliminate the kink is to do experiments under controlled conditions where a given outcome can be brought about by only one action. In that case the chain straightens out and the same action always leads to the same result. If the only way the rat can get a food pellet is to press a bar, it presses the bar. Of course it might do so with any of four legs, while facing toward or away from the bar, or it might nose it down or sit down on it, but it always presses the bar at least hard enough to make the response-recording contact close.

While those controlled conditions make life easier for the experimenter, the experimental animal doesn't need much coddling. Organisms produce specific outcomes, nut specific actions: their actions adjust according to the momentary requirements of the environment, so that when all the influences on the outcome are added up (including the influences created by the organism), the same result appears. That is what makes behavior seem purposive. Organisms don't just go through the motions like automata; they vary their actions in whatever way is needed to achieve the results we recognize as behavior. It seems that they produce those outcomes on purpose: that they intend that specific outcomes will occur, and vary their actions in any way needed to bring about those outcomes or maintain them against disturbances.

When you think of a behavioral outcome as a physicist would, you see immediately that actions MUST vary if that outcome is to repeat. That is because other forces and constraints are always acting on the same outcome. If the independent influences change but the outcome doesn't, physics demands and reason deduces that the action must have changed, too, precisely and quantitatively the correct way. Observation confirms this expectation in essentially every instance of behavior.

Neither physics nor reason is influenced by mere beliefs: if actions systematically oppose disturbances, that is all there is to it, they do. There is then nothing to keep an engineer using physics and reason from wondering how a system has to be organized to behave that way, discovering how, and building some examples to learn more about the principles of such organizations. The engineers who did that invented servomechanisms, and the principles they developed are called control theory, the foundation of Cybernetics.

Life scientists, however, didn't take that approach. Instead of finding out how purposive behavior works, they decided that it doesn't exist. Most of them simply ignored the kink in the causal chain: they experimented and reasoned and explained just as if there were no kink, as if regular outcomes are produced by regular actions. Among the few who decided not to ignore the kink, many explanations were offered to make it seem that the kink didn't matter. Some even decided that behavior really isn't regular, that we just classify random outcomes by similarity, imposing our desire for order on a basically random phenomenon. This preserves regularity in a different way, by asserting that irregular actions can lead only to irregular behavior, a blithe denial of observation.

Most of these scientists studied behavior as if regular outcomes were caused by regular antecedent conditions. They may have been working with real organisms, but what they saw was the organism they believed in. Belief feeds on confirmation and ignores counterexamples. What better aid to maintaining beliefs is there, than statistics? By observing relationships among antecedents and consequents statistically, one can ignore the precise and systematic variations of action that make the outcomes regular, in effect looking at behavior under the influence of the *average* disturbance and the *average* purpose. The essential data that prove behavior to be purposive are thus discarded as statistical noise.

Once it was agreed that purpose is the figment of a primitive imagination, it became the duty of every life scientist to explain behavior without taking purpose into account. You may ask, "How could they do that, being scientists, if behavior really is purposive?" The answer is, easily. All you have to do is keep in mind that behavior is caused by what happens to an organism, and not by any purposes inside the organism. You then vary your interpretations and observations until they make that fact true. Here is a brooding bird removed from its nest: it struggles mightily in the direction of the nest (no matter how far or in what direction from the nest you have taken it). What makes it do that? Why, the sight of the nest, what else? The visual image of the nest acts on the retina and nervous system, causing the muscles to produce forces in the direction of the nest. If a physicist or an engineer listens to this explanation with jaw agape, the behaviorist listens with satisfaction: it keeps faith with the basic premise of external causation, which is more important than asking a lot of finicky questions like "how?" Since we know behavior is externally caused, we don't have to take every fussy little fact into account. How often do we have to demonstrate an established principle?

I would settle for once.

Naturally, the custom of bending reason to accommodate a preselected premise has not encouraged clear thinking. Consider the subject of reward or reinforcement, and its relationship to the behavior that produces it. In an operant-conditioning experiment, a "contingency" is established through a "schedule of reinforcements," usually embodied in an apparatus that converts behavior into delivery of food pellets or some such valuable objects. Behaviorists have used such experiments to show how the reinforcements maintain the behavior that produces them, and how the details of the schedule influence the rate and form of behavior. They claim that they have shown by direct experiment how external circumstances control behavior: just the facts, no theory.

When you hear the word "schedule," don't you think of something like a timetable of events, like train departures or movie showings? It wouldn't be hard to see how a schedule of train departures would affect the times at which you might show up at the train station, and in fact you might admit that the schedule essentially determines when you will go, and to what station (if your purpose is to take the train somewhere). From hearing behaviorists talk, you might get the idea that a schedule of reinforcements works the same way: some routine for administering reinforcements is laid out in advance, and from knowing the schedule, one predicts the behavior.

That isn't how it works. A typical simple schedule could be described this way: for every tenth press of the lever, one pellet of food will be delivered. Does that tell us anything about when or how often food pellets will be delivered? If the organism never presses the lever there will never be any food delivered. The number of pellets delivered will be one tenth of the number of presses of the lever. The organism could press the lever in any pattern and at any rate whatsoever, and the reinforcements would dutifully appear at a corresponding rate and in a corresponding pattern. The ratio of reinforcements to lever presses is determined by the apparatus, but nothing else is determined.

In fact, in order to predict what the actual schedule of reinforcement will be, one would have to know what the actual pattern of behavior will be: the reinforcement depends entirely on the behavior, according to the settings in the intervening apparatus. This dependence is directly observable.

How do we get this simple relationship turned around to make reinforcement the cause and behavior the effect? Very simple: we turn to an insufficiently neglected mode of argument called assertion. We KNOW that the causes are external, however appearances, reason, and physics might delude us.

Lest anyone feel too superior to the behaviorists, consider this question. Do you think that you can make a child behave better by giving the child rewards for good behavior? Most people, I think, would say, "Of course." Actually, experience in many cases would justify the answer. But given that, how many of you would then say that the child behaved better *because of* being rewarded? Aha. Most of you.

But stop and think. What if the reward you used was a yummy tablespoon of vinegar? Oh, well, that's not a reward, you say. But why isn't it? What makes this stuff a reward when it's given, that stuff the opposite, or neutral (a yummy tablespoon of water)? At this precise point you switch from thinking of YOURSELF as the cause of behavior to thinking from the point of view of the child. A child, you point out patiently, wouldn't go to any trouble to get a tablespoon of water, and would probably go to a lot of trouble NOT to get a tablespoon of vinegar. I play dumb, and ask, well then why would the child go to any trouble to get a tablespoon of chocolate syrup?

You explain, perhaps not so patiently, "The child LIKES chocolate syrup, dummy!"

Oh, I see. The child is changing behaviors so as to get a tablespoon of chocolate syrup, is that it? Say yes, this is a Socratic Dialogue. And the child knows that if it behaves in a certain way you are likely to whip out the Hershey's? Say yes again, unsuspectingly. NOW I HAVE YOU. The child is acting in a certain way *in order to make chocolate syrup appear*, taking advantage of the fact that you are obeying a reliable rule for delivering the reward. The purpose of the child's behavior is to control the delivery of chocolate syrup, right?

Oh, no, you don't! Behavior isn't purposive! It's caused from outside! You have it all backward! You tricked me!

This Socratic Dialogue has gotten out of hand, as real ones do, but you get the point. You don't cause behavior by giving rewards. You just put yourself in the position of being used by someone who knows how to get you to give what that person wants. This is a perfectly good way to get people to use certain actions to get what they want, and maybe you can even teach them something in this way, but if the person doesn't want what you have to offer, you might as well give up. If you do give up, the person is likely to find another way to get the same thing: the actions aren't important. The result is the point: the result the person intends to get.

The human race has been using words like intention and purpose for a long time without any idea of how such things could exist (it did the same thing for equally long with words like "digestion," I should add). As we tend to do with all unexplained phenomena, people have tried to make sense of purpose and intention, whether or not they had any means of doing so. The result has been a great many flights of fancy, basically no more meritorious than fancying that purpose and intention don't exist. The arguments on both sides of this issue have necessarily been based on ignorance, because the means of understanding, control theory, wasn't worked out until the mid-1930s. No argument about purpose prior to that time could possibly have made any sense, however close it may seem to have come to the proper explanation.

The consequence of this long period of argument ex vacuo is that some positions have been very firmly established, for no good reason. Anyone who steps in now and offers to show how purpose really works is likely to be rejected by both sides: the proponents say it can't be that simple, and the debunkers think you are arguing on the side of the proponents. If you're not a Big-Endian, you must be a Little-Endian.

When you learn control theory you learn what a purpose is and how it works. You strip away irrelevant issues such as verbalization, consciousness, complexity, and position on the evolutionary scale. Life is purposive at every level of organization, right down to the little enzymes hopping along the backbones of DNA molecules, repairing them. Purpose is an inherent aspect of the organization known as a control system. It works just as people have always thought it works—without the metaphysical baggage. We might as well start using the term freely, because it's here to stay.

A Control Conversation

Between William Powers (1138 Whitfield Rd., Northbrook, IL 60062) and Ernst von Glasersfeld (180 Shadybrook Dr., Athens, GA 30605). Copyright 1986 by William Powers and Ernst von Glasersfeld.

Ernst: It could have been a conversation between Bill Powers and Ernst von Glasersfeld, but it wasn't. It wasn't even a real correspondence. Sometime in 1985, I asked Bill what seemed to be quite an innocent question: "By the way, how do you define 'control'?" It led to several long letters that read like soliloquies and, consequently, were never properly answered. Both Bill and I hate to see things go to waste; so, when the CC opportunity came, we decided to see whether there was

anything in those unletter-like letters that might stimulate discussion. What follows are some bits that we found and some that we didn't.

Bill: The first two meanings of "control" in my Random House dictionary go like this: v.t. 1. to exercise restraint or direction over; dominate; command. 2. To hold in check; curb; to control a horse; to control one's emotions.

Farther down the line we have controlling the spread of forest fires and rats, accounting controls, control experiments, and spiritualists' ghostly advisers called controls.

All these definitions have in common an unspoken controller attempting, wisely or foolishly, by means practical or impractical, to make something else be or act as the controller intends it to be or act.

We have, as a first approximation, a controller and an object of control.

Ernst: I'm not an engineer, and whenever I hear the term "control" I tend to have a flutter of apprehension. These flutters—Freud was right—come from the long ago, from past experiences which, rightly or wrongly, one happened to associate with one another. My early years of consciousness were spent in Central Europe, at a time when "control" had a way of ending up in the wrong hands, politically speaking. It made one wary of conceding control to anyone.

Bill: Control theory requires us to make everything explicit: the agent of control, the object of control, the means of control, and the goal of control.

Ernst: With wary people like me that is enormously important because we somehow remember that the agent, the object, the means, and the goal have at times been very much the wrong ones. But that is a political statement—and we don't want to get into politics. Let's go back to what you call control and how it works.

Bill: The process of control involves a continual dynamic balance among all external influences and internal variables. The current state of the object of control, as perceived, is compared continually with a specification, inside the agent, of the intended state. The difference is continually converted to action, through the means of control, along with the influences from independent agencies. This whole system, obeying the external laws of physics and the laws of signal-handling inside the agent, behaves as one unit.

Ernst: An awfully lot is said in these four sentences. Let me try to pick out a few bits, especially from sentences two and four. My bias is, of course, the constructivist theory of cognition. As I said when I first heard of it, a dozen or so years ago, your model of the control loop can be used as a solid building block in constructivist epistemology; but if one does that, one can no longer make some of the statements you apparently want to make in your role as engineer.

You are careful to say "The current state of the object of control, *as perceived*," because, having written a book with the title *Behavior: The Control of Perception*, you know better than anyone that the agent of control cannot possibly control anything outside his or her range of sensory signals. Yet, as engineer, you assume a somewhat privileged position with what Hilary Putnam has called a "God's Eye View" that gives you access to a more or less "real" object *outside* the agent of control. This is, indeed, indispensable if you want to go on and talk of "the external laws of physics" in good old objectivist fashion. From the constructivist point of view, you cannot do that, because the observed agent of control and his or her object of control are, after all, creations which you, the observing agent, assembled for the sole purpose of controlling *your* perceptions.

Bill: Some day I hope we will drop the "as perceived," for the reason that we will all understand that *it's ALL perception*. Then everyone will know that even physics and engineering are all about perceptions, not "reality." I use the physics and

engineering models as places from which to discuss behavior—the parts that appear to take place in space between people—for the simple reason that they work so well. They are extremely good at predicting what we will perceive when we initiate certain acts—better than the neurology model, the psychology model(s), the sociology model, the philosophy model, and the common sense model.

I predict that about a year after I perceive a stamp being affixed to this rectangle in my visual field and taste the glue on the flap and see the letter disappear into a blue box shape, I will see my fingers lifting the flap of my mailbox-thing and there will be a letter from you. It isn't how we talk, it is what we understand to be the case. I can talk freely about the laws of physics, and still understand that they apply to a perceived world, which depends in some unknowable way on another one I deduce to exist, but certainly isn't the same thing. Does the real world contain masses and forces? I don't know, but the perceived one definitely does. And I know the rules that connect these perceptions, too. Same goes for the laws of control.

Ernst: What immediately captivated me when, for the first time, I saw your model of the control loop in your 1973 *Science* article, was the dotted line you had drawn between the organism and its environment. From the point of view of the cognitive theorist who asks "How does an organism acquire *knowledge*?" that line is an iron curtain separating what is accessible to the organism and what is not. Whatever will eventually be called "knowledge" by the organism is likely to originate only from correlations the organism establishes between records of action and records of changes in sensory signals.

Letters

Between Larry Richards (Dept. of Engineering Management, "Old Dominion University, Norfolk, VA 23508) and Bill Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1986 by Larry Richards and Bill Powers.

The following is an edited version of some correspondence between Bill Powers and myself, initiated by him, on the current state of the American Society for Cybernetics and of cybernetic inquiry in general. With Bill's permission, I have decided to publish his views with the desire of stimulating a conversation on the issues he raises. I would like to solicit your comments and opinions for publication in future newsletters. I will collect, edit, collate, etc. your contributions and possibly pass them on to Bill or someone else for a reply—Larry Richards.

Dear Larry,   March 28, 1986

Thanks for the program [for the Virginia Beach ASC Conference] and especially for the nice note that came with it. I will be at the Gordon Conference, chairing one session but not presenting any talk. Hope to see you there.

Maybe you'd like to comment on my views about the ASC. I've been to almost every meeting since Philadelphia 12 years ago, and despite an irrepressible optimism concerning cybernetics itself, I've continued to come away with the feeling that something is awfully wrong. Everyone talks about the great power of cybernetic thinking in many fields of application, but somehow I always seem to miss the sessions at which the difference between cybernetics and common sense is explained. The nearest approach comes when someone reviews the principles of cybernetics, which is at least semi-technical stuff, although I don't think these vague and untested principles have anything to do with reality. There don't seem to be any technical sessions at all,

at the grown-up level. Most of the papers I hear are the sort of stuff that any bright person with a gift for words could make up out of his or her own head without requiring any special training, knowledge, or background except perhaps in some conventional field. And the dilettantes are underfoot everywhere—I like most of them I meet, but it seems to me they've taken over. A fuzzy miasma permeates the meetings.

But the worst part of these meetings is the air of being frozen in time, the time being about the mid-1950's or early 60's. Instead of developing new ideas and taking a critical look at old ones, which most growing scientific communities do continually, cybernetics simply celebrates Wiener, Ashby, Pask, Maturana, and von Foerster once a year, reaffirming faith in the old concepts of early cybernetics. The same talks are given every year, filled with the same phrases, the same illustrations, and the same total lack of experimental tests (or even testability). Cybernetics has become a set of well-rehearsed convictions in the minds of a small and essentially closed group of men. Cybernetic ideas that were at least fresh when offered have turned into slogans. I find it very discouraging. When one of these leaders addresses the group, it's in the role of authority speaking from on high, and it would be, at least for me in that atmosphere, impossible to stand up and say "Let's talk for a minute about whether there really is such a thing as a Law of Requisite Variety." What's expected is attention, admiration, applause, and respect for the dead, all of which are given unstintingly by the mostly lay audience, wearing their tee-shirts showing the snake swallowing its own tail. It's pretty intimidating.

Maybe I should ask you: what do you think of Ashby's idea of how a control system works? Do you think there is really a Law of Requisite Variety? If I don't have the nerve to challenge people at a meeting, maybe I can get into a discussion this way.

Regards, Bill Powers

Dear Bill: May 12, 1986

Thanks for your letter of March 28. I have become particularly sensitive over the past couple of months to the issues you raised. I would like to see some of these issues discussed openly. To get a second opinion on the matter, I showed your letter to Klaus Krippendorff who essentially agreed with me. Our mutual suggestion is that your letter be published in the ASC newsletter with an invitation for comments and responses. What do you think? I would not make this suggestion if I did not think that some of your points are well-taken and perceive there to be others in the cybernetic community who are having similar reservations about the current state of cybernetic thinking. This is not to say that I agree with you; I have to give it some more thought. But, I do believe that a conversation on these issues could help to clarify some differences of opinion (and style?) and possibly lead into new regions of inquiry. For example, I am not yet ready to give up on the Law of Requisite Variety, although I must admit that I have found it to be less and less useful as I have attempted to study the *dynamics* of control and adaptation. Perhaps we can discuss this further at the Gordon conference or the Control Systems Group meeting in August. In the meantime, I will try to prepare the more detailed and thoughtful response that your concerns deserve.

Sincerely,   Larry

Dear Larry,   May 18, 1986

My immediate reaction to your suggestion was to chicken out. But re-reading the letter I sent you, I think I'm willing to let it stand

and be published, ignoring my impulse to soften it. This in spite of the guilt I feel because of generous support and nice remarks by some of the leaders I mentioned in that letter. I do feel like an ingrate for raising doubts about the productions of such really nice people. This is a problem for me, because I'm always afraid of running into "love me, love my dog." Worse, in the heat of discussing issues I sometimes get careless and give the impression that I don't respect the people whose ideas I disagree with, and I'm worst about this when I'm talking on my feet. Maybe if we confine the discussion to print I can behave myself a little better. You can quote me. A LITTLE better.

I'm enclosing the second round of a paper ["Purposive Behavior"] I've been sending to people in the Control Systems Group for criticism. From this paper I think you may get a better idea of why I view Ashby's LRV with skepticism. Ashby abandoned control theory halfway through his first book [?], and adopted instead the old "compensatory response" model to explain control. I hate to criticize Ashby since his *Design for a Brain* was one of my main reasons for getting into this business back in 1953. But. I think that "requisite variety" is a very clumsy and inappropriate way of talking about something that can be explained far more directly and fruitfully using control theory. LRV is a generalization that follows trivially from control theory. Ashby, like many cyberneticists, tried to achieve broad generality before he had really checked out his premises and solved the little problems. I'm afraid he didn't know much about control systems, real ones. It took me a long time to realize that.

If organisms don't control outputs, and my paper shows pretty clearly that they don't, what happens to all the fancy models that depend on a view of organisms as input-output models? Down the tube. A lot of mathematical talent has been wasted on analyzing input-output relationships that don't really exist. Makes me cry—as a mediocre mathematician, I long for some of that talent to get to work on control theory in behavior. But getting started in control theory requires so much UNlearning! It's really a totally new way of seeing behavior, despite being close to 50 years old. It takes about two years for a WILLING learner to get over the hump. Why would anyone with an investment in the old input-output view make such an effort? In fact they hardly ever do. They just try to assimilate control theory in a way that preserves what they thought before.

The early cyberneticists never suspected what they had. They thought communication was the main topic of Wiener's book. (They still often cite the subtitle as "communication and control..." when it was the other way around.) Control theory was treated as a special case of far more general (and much vaguer) systems analysis—look at the contempt shown by Bertalanffy: in one of his block diagrams he put a little hook going nowhere, and with that dismissed the subject of feedback. I could put together a list of erroneous statements about control theory quoting nobody but past presidents of the ASC, and would include just about all of them (leaving a little escape hatch there). My impression is that modern cyberneticists think of control theory as a little corner of general systems theory, and so they haven't bothered to learn it. If they studied control systems and learned how they really work, they would see that this little corner is really a cornerstone. It gives us the first correct (or at least workable) concept of what behavior is. It's a radical departure from what scientists have thought for 350 years. Damn it.

So, I'm already writing the second installment. Well, let's see what happens.

Regards, Bill

P.S. Chicken again—why don't you edit my comments to make me seem less of a curmudgeon?

Dear Bill: November 6, 1986

It has been a while since your last letter, and I have seen you on two occasions in the meantime. My response to you at this time, before opening up the discussion for the rest of the readership of *Continuing the Conversation,* will be brief. First, I do not regard you as a curmudgeon, although I rather like curmudgeons anyway. I respect your differing opinions and think they can play an important role in the interaction (I desire) between ideas in cybernetics. Second, I think that there are some "fundamental" differences between control theory and some other cybernetic theories, as ✳ you have pointed out in your recent paper, "Control Theory, Constructivism, and Autopoeisis". I believe that these differences are such that they could provide a framework for some creative interaction and the generation of new directions for cybernetic thinking. Third, for this interaction to be possible, the proponents of these differing points of view must not enter the conversation as evangelists; they need to all be willing to change their opinions, not necessarily to the opposite point of view, but at least to some new, yet unidentified, position. (This is my opinion.)

I have one question I would like to address to you, or to others reading this, as a way of initiating some discussion. When you refer to how control systems "really work" or to someone's lack of familiarity with control systems, "real ones," what do you mean by "real"? How would you propose establishing a common ground from which individuals who have different concepts of the nature of reality could enter a conversation on control theory? I realize these are philosophical questions, but I also perceive that one of the barriers to interaction within the cybernetic community is the presence of conflicting philosophical assumptions. It seems to me that these need to be clarified at the outset.

Sincerely, Larry

Dear Larry, November 13, 1986

OK, I'll try to answer the specific question: what is a "real" control system? I can answer this question on two levels: theoretical, and seat-of-the-pants. I don't think a person can really understand control theory as I propose it without at least some acquaintance with both levels. You've wiggled the stick on my computer and you know pretty much about my theory. I wish everybody who makes remarks on this subject could say as much.

From the stick-wiggling point of view, a real control system is what you are while you are keeping the cursor lined up with the moving target, or keeping the pitch of the sound constant in spite of the disturbances. A real control system acts continuously, maintaining some perception in a preselected state despite a completely unpredictable and invisible disturbance. If you can generalize when you let go of the stick and go on to other pursuits, you will realize that you seldom behave in any other way—if ever. Your actions adjust automatically to produce the consequences you want to perceive. Your actions are used mostly to keep disturbances from having any effect on what you intend to perceive.

You've also played with the arm mockup I brought to a couple of meetings. That's a real control system, too. When you push on the arm it pushes back. My simple working model skips a lot of detailed processes that a real arm uses to achieve stability, so it isn't utterly convincing, but it still feels pretty alive.

A well-designed artificial, but still real, control system is a marvel to behold. A strip-chart recorder is an example, the kind that uses a motor to position the pen. If you took the pen between thumb and forefinger and tried to move it, you would swear it was stuck in a mechanical detent. Actually, the electronic system detects position errors smaller than you can detect, and what you're feeling is the resistance of the motor to your push. Turn the power off and it ceases to resist—you can move it easily. There is

no significant friction, no detent—just current running through the motor, opposing the push with precision. The best artificial control system I know of moves the heads of a disk drive, weighing three or four pounds, a distance averaging one inch every 1/20 second, with an accuracy of 0.002 inch. It continues doing this even after a workman accidentally tilts the drive cabinet into the hole made by a missing raised floor section (affidavit available—from several shocked technicians and one unrepentant painter who used the drive cabinet to hold up one end of his scaffold. The users never knew the difference).

Artificial control systems teach us principles. When we understand the principles, we can apply them to natural control systems: organisms. Some of the principles are:

Control is a simultaneous interaction between organism and environment, not a sequence of events. The proper mathematics is not that of recursion or sequential logic, but differential equations, or any kind of simultaneous equations. All parts of a control system are active at the same time, not one after another. While the output is changing the input is changing, and vice versa.

Control regulates input, not output. Output changes according to every disturbance; the result is stabilization of input at a preselected level. No sensing of the causes of disturbances is required.

Control systems are purposive: they act to make their inputs match preselected states represented as reference signals inside the control system. They don't need to be told what moves to make to accomplish this: the proper actions arise out of their design. They don't depend on producing specific amounts of output, carefully calculated: if the output device doubles its sensitivity to driving signals, you probably won't see any difference in the behavior.

What makes control systems work as they do is the way they are organized inside—not general principles like the Law of Requisite Variety. Maybe, as you say, there are uses for the Law—but the LRV follows from the properties of control systems and doesn't explain the properties of control systems. The control model underlies behavior: abstract principles float in abstract intellectual space above behavior. Guess which kind of explanation I prefer.

I pass the token to the next node—or is it the pipe to the next Indian? (Mary says the pipe is a calumet. Wait a minute... dammit, she's right again.)

Best regards, Bill

Control Systems and Psychological Applications

By Douglas A. Ross (Dept. of Psychology, Clark Hall, Indiana University of Pennsylvania, Indiana, PA 15705). Copyright 1986 by Douglas A. Ross.

Control Systems Theory or Feedback Control Theory (FCT) (Powers, 1973) is currently in the process of making something of a comeback as an explanatory system in psychology. While cybernetics has been "underground" for several years, Powers' theory is beginning to show strength and flexibility as a model for human behavior. The strength of the system is a pervasive ability to explain a wide diversity of problems. Recent work by Pavloski (1986) has demonstrated that Control Theory is an appropriate explanatory device for cardiac reactivity, and some versions of Control Theory (i.e., Carver and Scheier, 1982) have extended such interactive mechanisms to social phenomena. Some of the best work (Marken, 1986; Powers, 1978) remains that derived directly from Powers' approach in using the equivalents of arcade video games to demonstrate subjects' abilities to control perception, thus reducing internal differences (usually called "errors") between expectations (usually called "reference

values") and perceived performance. A common example of such situations is represented by the driving game in which there is a moving roadway and a steering wheel. As the roadway moves, the player's task is to keep the car in an appropriate location on the highway. Movement of the wheel brings the subject into position to perceive the portion of the road where he or she attempts to keep his or her vehicle. The goal of positioning the vehicle on the road is the reference value, and the magnitude of error generates a measure of success, i.e., time on target.

The challenge of Control Theory is to extend the explanatory system beyond the limited range of laboratory environments to more ecologically valid behavioral phenomena. Several authors have used *partial* feedback control system models in their work. Most notably, Bandura (1978), in a series of articles on "reciprocal determinism", has used such models to describe the interactive motor learning of subjects in his classic studies. Lazarus (Lazarus and Launier, 1978) has used a similar interactive model to describe cognitive influences on stress and coping. Lazarus' appraisal model can be translated into Powers' Feedback Control Systems Theory. Shallice (1972) has also used a cybernetic model to explain the phenomena of attention and perception.

A theory or model is useful only to the extent that it meets minimum scientific criteria and is supported by empirical demonstrations, explains data gathered by others (i.e., is inclusive), and is ecologically valid. A series of case studies presented below shows how Feedback Control Theory meets these requirements. Support by empirical demonstrations is illustrated by a description of a recent study in support of FCT; inclusivity is demonstrated by considering a study currently in press but not designed to test or be explained by FCT; and two ecological vignettes from "real life" are given.

1. Recent Study Using FCT

Pavloski (1986) has shown that FCT provides both predictions and confirmations of changes in cardiac reactivity under stress. In his most recent study, subjects trace a difficult pattern which is rotated through several randomly selected angles between 0 and 360 degrees. The visual feedback is via a video screen. The task is to stay on the line—that is the reference value. Error is represented by deviation from the line. The control of perception includes motor activity of arm, hand, and fingers, which bring the drawn line closer to the target line. Pavloski, Kennedy, and Donovan (1986) have shown that cardiac reactivity (as a measure of stress) follows error veridicially, and that subjects work hard to reduce error by producing behavior to control perceptual quantities.

2. Research by Others: The Power of Negative Thinking

One of my colleagues, Alex Rich, has an article in press (Rich and Dahlheimer, 1986) in which he argues that negatively affective cognitions, rather than creating a situation in which there is diminished performance, actually lead to increased performance. This runs counter to the expectations of Beck (1976), Ellis (1977), and other cognitive psychologists who have studied the influence of cognition on behavior. Rich argues that the reason negative thinking can lead to improved performance is because of a reduction in expectations, resulting in less of a threat to individual self-esteem (see Frankel and Snyder, 1978). With the reduced threat to self-esteem, a subject can perform at a higher level, although if performance improves too rapidly, there will be adjustments made so that expectations (reference levels) are not raised irretrievably high.

Control Theory amounts to a powerful explanation for this unanticipated phenomenon. In particular, the protective and salient self-esteem loop represents a relatively high level in Powers' hierarchy of loops, whereas the more mundane effect of negative thinking at some lower level actually decreases the subject's expectations and thereby reduces performance. In Rich's

experiments, the subjects bring themselves to produce more correct responses. With expectation lowered by negative thoughts, the self-perceived performance can reduce error to near zero and therefore lead to a low tension state in which expectation and performance coincide.

3. Ecological Validity First Vignette: Behavior at a Symposium

(I am in fact the organizer of a symposium on FCT scheduled for the Annual Meeting of the Midwestern Psychological Association in Spring 1987. My background is in the study of perception; since Powers' book is subtitled "The Control of Perception," I want to lay out metaphorically the perceptual basis of Control Theory. This vignette represents an extension of the ideas of Control Theory to the actual gathering of a public for the purpose of perceiving the symposium.)

Perception isn't that which causes behavior, though it does so in part. Perception doesn't explain why we need to change in response to things in the environment, though it does so in part. Perception is the way we control what in the external environment we can selectively use to bring about a reduction in "error." The selectivity of external perceptable events must be balanced with controls within the internal environment, and, in particular, with how we manage and moderate our schemas both from the standpoint of our use of our memory and also in the salience of our affective experiences.

We control what we perceive (1) by moving our bodies to different places in the environment or (2) through conscious constructions which alter the perceptual mechanisms that transduce what is available. Our conscious constructions, based largely on our own episodic memory, represent the most superordinate (high-order) loop within the feedback hierarchy. This is the "self" that is the executive of the control system. The executive self can assess where there is a difference (error) between expectancies we have for ourselves (reference levels) and reality, and activate our organisms to do something (behave) in an attempt to perceive that which will reduce the difference between expectancy and reality. This never-ending process is what is called human behavior and experience.

I presume that those who are attracted to a Control Systems Theory symposium fall into two groups. Some inherently hungry for more information about control systems seek us out because of an error internal to their own systems, but most are influenced by an external disturbance. The disturbance is that I am brazen enough to think that anybody would be interested in a new version of cybernetic theory: So I presume that some of those present at the symposium are motivated by an external disturbance and the need to either dismiss it or try to fit it into their schematography. The disturbance has the function of bringing members of the audience to the place where they can perceive talk about Control Theory. Those in the audience will try to reduce the disturbance by selectively perceiving that which reduces error within. Which level of the loop system this works at for each individual is unknown to me, but presumably it might range from "this is a good place to rest" all the way up to being the most ultimate satisfaction for the "self."

For me, the issue is slightly different. I am motivated by the error instantiated by w hat I know to be an effective model and psychology's lack of embracement of it. We "believers" are trying to show each other, and incidentally those in the audience, that this is an explanatory system which can reduce our internal errors when we are investigating psychological phenomena and *increase* the errors at higher levels in our hierarchies so that *all* of us are driven to bring these issues to the perceptual awareness of a larger and larger segment of our colleagues.

Second Vignette: A Control System Comes Home for Lunch

As lunchtime nears, it becomes necessary for me to act in a way that brings the perception of having lunch with my wife into awareness. The disturbance, originating with a look at the clock, moves me to get on my coat to go. The coat goes on to avoid losing it, which would be a disturbance were it not prevented. I go to my car, into it, and onto the road to my house, each action a part of the higher order needed to get home, but each a lower level control of ensuing perceptions necessary to reduce error—to bring my wife into view, rather than my office, the parking lot, the road seen through the windshield, or my driveway. While each of the actions reduces error, each leaves enough remaining error to keep me behaving.

I get out of the car and go into my house and see my wife. Having eliminated one error, a different control system takes over to serve the difference between my expectancy to eat and finding and then eating food. I am aware of getting to where I can perceive it, so I can act with my hand to get it to my mouth. I think of Paul Churchland's "Roger" (1986), whose computer stomach never gets its food because "he" can't handle gravity. I wonder what control system error that thought serves. At higher levels of the hierarchy I am sure that I am solving a daily problem about lunch, about food rhythms, about nurturance, about life itself. Considering each of these abstract error types generating their pervasive effects down through the hierarchy, and creating errors to be readjusted at lower and lower levels down to the slightest twitch in my finger, leaves me contemplating whether there is a place for an "I" in one of the loops, and my mind loop wanders off again, seeking forever why I am thinking in the first place, or at all.

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Control Systems and Cardiovascular Reactivity: Toward an Understanding of Cardiac-Somatic Interactions

By Raymond Pavloski (Dept. of Psychology, Indiana University of Pennsylvania, Indiana, PA 15701). Copyright 1986 by Raymond Pavloski.

William Powers (1979) has referred to three types of relationships that hold between psychologists and the control systems approach to human behavioral organization that he developed: advocation, rejection, and ignorance. In my case, the first type of relationship holds. I would like to use the forum of this newsletter to express my views on the strengths of this approach, and to describe how it is guiding my research in the area of cardiovascular psychophysiology.

The control systems approach is based on the observation that humans control their inputs (Powers, 1973). My primary reason for pursuing this approach is simple: unlike every other approach taken in the life sciences and social sciences, it makes possible a model of a human being that can actually behave in a physical environment. All other views are based on the premise that output is controlled. However, it is easy to verify that overt behavior and its consequences are jointly determined by neural outputs (motor commands) and by environmental variables (disturbances) that are independent of those outputs (Powers, 1973, 1978, 1979; Marken, 1986). The "behaviors" that would result from a system that controlled its outputs would be subject to unpredictable disturbances. Such a system would not survive. Negative feedback systems that control their inputs are required to cancel the effects of disturbances and thereby to make behavior possible. This observation is not a hypothesis requiring repeated empirical tests. Rather, it is a principle forming the basis for theories of biological-behavioral organization.

Making this observation and illustrating it so well is one of William Powers' great contributions. Another contribution is his recognition of its implication for the structure of human behavioral organization. The implication is that control systems are organized in a hierarchical fashion, with higher-order systems setting the reference levels for lower-order systems. The hierarchy appears to be necessary for behavior as we know it to exist. In this sense, it shares with the observation the status of a principle. The magnitude of muscle tensions must be controlled in order to make behavior possible, since disturbances introduced after a motor command signal (e.g., changes in the effects of a motor command due to muscle fatigue, accelerations, or fluctuations in neurotransmitter and enzyme levels) make it impossible for any given motor command to produce constant behavioral results. Powers realized that muscle tensions must be controlled in order for control of other quantities to be possible. Thus, more complex controlled quantities (those defined by sets of neural computations on muscle tensions and on other neural signals representing the intensities of physical stimulations) can be controlled only by dynamically altering the reference values that define the values

at which muscle tensions are controlled. This argues for a hierarchy of control systems with increasingly complex controlled quantities (Powers, 1973).

The control systems approach rests on the foundation of a hierarchy of negative feedback control systems. Recognition of the necessity of this framework as underlying human behavior has consequences for the kinds of questions asked by researchers and theoreticians. I would like to illustrate some benefits of such recognition by describing my own efforts in cardiovascular psychophysiology.

Psychophysiologists are psychologists who assume that an understanding of human behavior will be easier to achieve and more complete if the biological and behavioral organizations of the individual are jointly studied. As a general rule, psychophysiologists restrict their studies to humans and measure the activity of large numbers of cells using noninvasive techniques. The study of phasic and tonic alterations in measures of cardiovascular system activity and their relationships to behavioral and psychological variables has been prominent in this field of inquiry. Understanding such relationships is thought to be of importance for advancing theories of emotion, and for advancing our understanding of the role of psychological variables in the etiology of cardiovascular disorders (Krantz and Manuck, 1984; Krantz, et al., 1982). I would like to use the example of alterations in cardiovascular activity to illustrate the advantages of a control systems approach over approaches taken both currently and in the past.

Many empirical investigations have been grounded in Duffy's (1957) activation theory, which in turn had its roots in Cannon's (1915) notion of the body preparing for fight or flight. Duffy postulated a unidimensional continuum of activation underlying the "intensity" aspect of all behavior, to which the quality of behavioral performance is related. Many psychologists have viewed and used various measures of cardiovascular activity (such as heart rate) as interchangeable indices of where an individual falls on the activation continuum.

Despite its phenomenological appeal, the concept of a unidimensional continuum of activation and the related use of different physiological measures as equivalent indices of arousal or activation level have been shown to be overly simplistic. A phenomenon discovered in stimulus-response psychophysiology both demonstrated this shortcoming and pointed toward an alternative view of "stimulus-elicited" phasic changes in heart rate. Lacey (1967) showed that *both* tasks requiring "environmental intake" (e.g., waiting vigilantly for a signal to respond in a reaction time task) *and* tasks requiring "environmental rejection" (e.g., mental arithmetic) are accompanied by arousal-like changes in skin conductance and vasomotor activity, *but* that heart rate *decreases* during "intake" and *increases* during "rejection." Lacey and Lacey (1978) combined data from psychophysiological experiments and from physiological studies of the baroreceptor system in proposing what is sometimes called the *intake-rejection hypothesis*: decreases in heart rate and blood pressure improve performance on environmental intake tasks, and increases in heart rate and blood pressure aid performance that is improved by environmental rejection. Both effects were proposed to be mediated by baroreceptor influences on sensorimotor cortical processes.

The intake-rejection hypothesis has proven difficult to test, and not all results are consistent with the hypothesis. Obrist (1976) has argued that correlations between quality of performance and decreases of heart rate on environmental intake tasks reflect the integration of the skeletal-motor and cardiovascular systems at a high CNS level. During tasks requiring vigilant "environmental intake," individuals show reductions in task-irrelevant somatic activity. The coincident reduced metabolic need is associated with a centrally-commanded drop in heart rate. The reduction in task-irrelevant activity is associated with an improvement in performance. The use of pharmacological blockade of the

vagal innervation of the heart demonstrates that the decrease is produced by an increase in parasympathetic stimulation, which masks a simultaneous increase in sympathetic stimulation, the latter accounting for arousal-like changes in skin conductance and vasomotor activity. Obrist's argument has been strengthened by his demonstration that paradoxical phasic decreases in heart rate to a conditioned stimulus paired with shock, which produces an unconditioned increase in heart rate, are also accompanied by somatic immobility.

Obrist and his colleagues (e.g., Obrist, et al., 1983) have gone on to demonstrate that such metabolically-efficient coupling of the cardiovascular and somatic muscle systems tends to be the rule in tasks ostensibly and inferentially involving no effort on the part of an individual to cope with the situation, with the parasympathetic innervations dominating control of the heart. However, in situations that obviously permit active coping, a different picture emerges: sympathetic influences become dominant, with increases in blood flow that are greater than needed to meet metabolic needs (Sherwood, et al., 1986). There is evidence that such metabolic inefficiency is an etiologic factor in essential hypertension (Obrist, et al., 1983) and in coronary heart disease (Krantz, et al., 1982).

There are, of course, complexities in this neat and simple picture. There are very large individual differences in the magnitude of cardiovascular changes observed. High reactors (individuals above the median with respect to heart rate increases in active coping situations) show increases in both active and passive coping situations. In fact, the increases shown by high reactors in passive coping situations are greater than the increases shown by low reactors in active coping situations. There is no understanding of the basis for these individual differences.

Another complexity arises in attempting to understand the nature of situations in which large increases are observed. In order for reactivity to be sensible from a biological perspective, its adaptive significance must be addressed. Obrist (1981) has argued that tasks requiring effortful, active coping call forth a preparation for muscular exertion, and Schmidt (1983) has suggested that a preparatory increase in cardiac performance would guard against a large fall in blood pressure that might result from a sudden increase in skeletal muscle workload. Since the difference between the blood pressures at any two points in the circulatory system is the main driving force for blood flow, such a mechanism would appear to have adaptive value. However, this argument does not connect well with data on situational influences on reactivity. There are several problems. High reactors also show reactivity when nothing can be done in the situation, and high reactors sustain reactivity long after it is apparent that a task does not require any significant degree of muscular exertion (Obrist, et al., 1983). In addition, if expectation of effort is involved, then performance should be better and subjects should report making a greater effort in tasks where reactivity is highest; yet, neither occurs (Light and Obrist, 1980, 1983; Obrist, et al., 19781.

I get the discomforting idea that the conceptual basis underlying cardiovascular psychophysiology research has gone full circle—and that this may have a lot to do with the present difficulties in understanding cardiovascular reactivity. Early notions about activation or arousal suffered from physiological naivete in treating different cardiovascular measures as equivalent indices of a unidimensional activation continuum. An even more serious error was made, I think, in postulating as an explanation for a physiological phenomenon a psychological concept that was not made part of a bio-behavioral organization capable of behavior. The same error was made in proposing the intake-rejection hypothesis. Environmental intake-rejection is not a part of a theoretical bio-behavioral organization that can produce human behavior; it is an objectification of the subjective impression of experimenters that some tasks yield better performance when "attention" is directed outwards than when it is directed inwards.

Both concepts sit outside the human; neither has been made an aspect of a model of a functioning human.

Understanding came in this research when Obrist and his collaborators began with *part* of a model of a functioning organism—the part of the model stating that motor outflow from the CNS to the skeletal musculature is integrated with motor outflow to the cardiovascular system. This very small part of a complete model permitted these investigators to understand the meaning of parasympathetically-mediated changes in cardiovascular activity that happened to accompany certain situations. This understanding did not come from, and indeed was in all likelihood hampered by, attempts to predict cardiovascular activity in terms of objectified subjective impressions (e.g., that certain situations elicit fear, or environmental rejection, or environmental intake).

It is unfortunate that the conceptual basis of research on cardiovascular reactivity has now returned to the postulation of objectified subjective impressions as "eliciting" reactivity. For there appears to be no substantive difference between the concepts of effort and active/passive coping, on the one hand, and activation, fear, and intake-rejection on the other. It is tempting to conclude that when we start with something other than a piece of a model that is capable of behaving, we are bound to wind up being unable to explain reactivity or any other phenomenon.

Control theory offers a more complete model and holds out the promise of developing a greater understanding of how our biological and behavioral organizations are integrated. Since the control systems approach leads to a model that can behave, it should fare better than previous approaches. We can of course determine whether experimental data fit predictions derived from control systems explanations. There are, in addition, at least two other criteria which any explanation of reactivity must meet: the explanation must in principle lead to an unambiguous test, and the explanation must address the adaptive significance of reactivity.

I have reasoned elsewhere (Pavloski, 1986) that if one begins with the hierarchical organization of control systems, reactivity becomes understandable as a necessary condition for adaptation. Consider a situation in which the deviation of the perceptions of controlled quantities from their reference values (the control system error) begins to depart substantially from zero. Only small deviations are needed to drive behavior when the systems have even moderate gain, as they do (Powers, 1978). More substantial deviations will at least call forth large increases in the outputs of the systems involved. During the period of time in history when our behavioral organization was evolving, it is likely that these outputs involved considerable skeletal muscle activity. As Schmidt (1983) has suggested, a sudden increase in muscle activity will produce a drop in the driving force for blood flow, and thereby compromise flow to the brain, unless the cardiovascular system prepares for the imminent increase in activity. Control system error can produce the needed preparatory increase in cardiovascular activity, conferring on the individual an obvious survival advantage.

In modern Western society, the majority of our outputs do not involve considerable skeletal muscle activity. Thus, preparatory increases in cardiovascular activity are not required. The control system error hypothesis of reactivity provides an explanation for the observation of increases in cardiac performance that are unnecessarily large with respect to tissue metabolic needs (Sherwood, et al., 1986); they result from error in the operation of behavioral control systems in situations permitting only sedentary levels of muscular activity (Pavloski, 1986).

An experimental test of this hypothesis requires means for the manipulation and measurement of control systems error. Two methods have been devised and shown in pilot studies to be feasible. In the first method, subjects control the position of a cursor on a video screen against the influence of random disturbances, some of which make it impossible for the subject

to maintain near-zero error. Data from pilot studies reveal that subjects exposed to this manipulation do show reactivity that is consistent with results of other research in its range of magnitude and variability (Pavloski, 1986). Improvements in the method of measuring control system error and in monitoring the parameters of the control systems involved in this task have been made, so that a more precise test of the control system error hypothesis can be conducted. The second method uses a task in which subjects attempt to trace a line-drawing pattern, the video image of which has been rotated through a specific angle. The rotation of the visual image seen by the subjects effectively distorts the normal relationship between objects in the environment and visual perceptions, thereby producing ongoing error in the systems having the reference level "drawn line coincident with line to be traced." Data from pilot studies show the predicted positive correlation between control system error and heart rate (Pavloski, Kennedy, and Donovan, 1986).

Clearly, the control systems approach meets the criteria specified above. Its ability to do so rests on a model of behavioral organization that is capable of behavior.

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Control Systems in a Clinical Setting

By David M. Goldstein, Ph.D. (York House East, Suite 102, 214 W. Main St., Moorestown, NJ 08057). Copyright 1986 by David M. Goldstein.

I spend most of my work time doing individual, marital, family, and biofeedback therapy in a private practice setting. I have found William Powers' Control Systems Theory (CST) to be very helpful in the therapy work I do. The major reference for CST is Powers, 1973. It should be noted that Powers never presented his CST as a theory of personality or psychopathology. He intended it to be a model of nervous system functioning. Nevertheless, I, and others, have found it useful in applied situations.

The ideas of CST can be used in individual, marital, family, and biofeedback therapy. I don't have to shift from one set of ideas to another. I find this very convenient. I do not know of any other theory that offers this kind of universality or integration ability.

The basic idea of CST is to view people as in the process of controlling their perceptions. A perception is controlled when it matches a perception in a person's memory which the person selects as the standard. People come into therapy because they are not able to control their perceptions and want some help in regaining control. CST breaks the meaning of perception down into ten different kinds, which are clearly defined and related to each other. I, as a therapist, try to identify the perceptions which are not being controlled by the person. This becomes a statement of the problem or chief complaint.

People who come into therapy are usually having negative kinds of feelings. Why? CST offers the idea that feelings are associated with the comparison of wanted and actual perceptions. Negative feelings result from a nonzero difference between wanted and actual perceptions. Within CST, there are no statements to explain why a person would have one particular feeling rather than another. It is reasonable to think that the nature of the perception which is uncontrolled largely determines this. For example, the perception of danger in a situation would likely lead to a feeling of fear. I like to use Plutchik (1980), who has come up with a classification system for emotions, to flesh in the details about emotions which are missing in CST.

People who come into therapy are usually having some kind of physical symptoms. Why? CST offers the idea that the bodily stress response is also related to the comparison between wanted and actual perception. I use biofeedback theory to teach people about improving their perceptions and control over bodily states. I have used CST to provide a theoretical framework for biofeedback therapy (Goldstein, 1978).

Therapy is basically a process of change. CST offers the idea of "reorganization," which is presented as a random process producing change. When the existing control systems are no longer adequate for meeting the biological needs of a person, the person must change their control systems. This can be a frightening experience. People will often pull out of therapy because the change is uncomfortable. Things may seem to be getting worse rather than better. CST encourages the person to persist. The discomfort is a necessary part of reorganization.

Sometimes people acquire "psychotic" symptoms such as hallucinations or delusions. Why? CST offers the idea that it is one possible outcome of the reorganization process if the person does not come up with realistic control systems. And CST offers a way to help the person displaying psychotic symptoms to realize that they are self-generated: if the person can alter a perception voluntarily, this supports the idea that it is self-generated.

During the therapy process, a person will sometimes act in ways that the therapist perceives as counter to progress. This is called resistance. Why do people resist? Aren't they in therapy to get better? The concept of resistance follows directly from the basic idea of people as control systems. The therapist is led to expect resistance as the norm, not as the exception.

During therapy, conflicts within the person, couple, or family may become apparent. Most therapies view conflict as bad, but do not explain why. CST offers the idea that when conflict exists between two control systems, they cannot keep *either* of their individual conflicting perceptions controlled. This is obviously a bad situation resulting in negative feelings and bodily stress responses.

CST does not tell the therapist how to act during therapy. It does not tell the therapist to act friendly or unfriendly. It does not tell the therapist to act in a controlling manner or an autonomy-giving manner. The therapist cannot go inside the person to change the way something is being perceived. Through talking, the therapist may be able to get the person to change the way something is being perceived, or to change perceptual goals. Through discussion and practice, the therapist may be able to get the person to develop some new skills or alter some old skills. CST leads to the expectation that the therapist cannot and should not force the person to change.

Readers interested in the clinical applications of CST are directed to Ford, forthcoming, Glasser, 1984, or Robertson, 1986, for additional information. Empirical research in this area is virtually nonexistent, to the best of my knowledge. I am currently involved in some pilot research efforts aimed at discovering controlled perceptions in the Interpersonal relationships of persons in therapy.

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CST and Self Image

By Richard J. Robertson, Ph.D. (Dept. of Psychology, Northeastern Illinois University, 5000 N. St. Louis Ave., Chicago, IL 60625). Copyright 1986 by Richard J. Robertson.

The research project David Goldstein and I have been working on, attempting to use Bill Powers' "test for the controlled condition" in assessing the "self" as a true control system, is finally coming along. We tried several different methods of measurement and found that many subjects simply went along with misinterpretations of their self images, instead of correcting those misinterpretations. But the most recent and most simple method seems to have gotten the most well-defined results. We asked subjects to select 16 adjectives out of a pool of 89 (from a standard instrument which they had prepared previously). Then the person working with a subject would say, "I don't think you're like (whatever adjective had been picked by the subject as *most self-descriptive*)." The subjects' responses were strong and almost universally "corrective." In my opinion, this suggests that the self image is being kept under strong feedback control, at least by the people we have done this with so far.

The neat thing about this extremely simple methodology is that anyone can test it out for himself or herself. Just wait until someone with whom you are conversing makes a self-descriptive statement ("I'm very particular about what I eat," for example). Immediately *disturb* the person's self image by saying, "No, you're not," and see what happens. According to Powers' definition, a variable under control by a feedback system will immediately be corrected to its prior state when disturbed by an environmental influence.

I would love to hear about the results from anyone who tries out this kind of experiment.

The Role of Feelings
in Control Systems Theory

By Edward E. Ford, M.S.W. (10209 N. 56th St., Scottsdale, AZ 85253). Copyright 1986 by Edward E. Ford.

Any time we set a goal, certain feelings are going to be attached to this goal, but the kinds of feelings and our degree of awareness of them are going to depend on the chain of events that go to make up what we eventually experience as feelings and emotions.

When we want something (what control theorists call a reference condition), two signals are sent out by the nervous system. One signal activates the muscles necessary to achieve the goal, whether it be by moving our hand, mouth, tongue, or whatever. The other signal goes to the physiological system and tells our various organs to provide the energy needed to achieve what we want.

This latter signal is where feelings originate. It is actually a pattern of signals sent out from the hierarchy of wants which makes up our goal. This specific pattern of signals activates the organs within our physiological system. These organs secrete various types of energy-modulating substances, such as adrenaline and blood sugar, providing us with the necessary energy to achieve what we want.

Our perceptual system senses these substances at "intensity" and "sensation" levels of the perceptual hierarchy (see figure). At the "configuration" level, the perceptual system identifies these substances as individual feelings, such as fear, anxiety, stress, anger, guilt, joy, humor, or whatever. At the "relationship" level, the system ties these feelings to the *thought* (cognitive) component of what is being perceived. If my son leaves the front door open as he enters our house on a cold winter morning, and I want him to close the door, I may attach the feeling of anger to my perception of my son and his failure to close the door. If he fails to shut the door after my request for him to do so, I may generate a stronger want—more energy is poured out by my physiological system, which is sensed by my perceptual system as increased anger. I call this "getting angry at my son." I *might* get it *backwards* and mistakenly think "my son made me angry," which of course isn't true. I created the anger.

HOW OUR SYSTEM WORKS

Perceptual Hierarchy

WHAT WE WANT AT VARIOUS LEVELS

RELATIONSHIP (feeling tied to intellectual part of perception)

CONFIGURATION (specific feeling is identified)

PHYSIOLOGICAL CHANGES THAT CREATE ENERGY TO ACCOMPLISH WHAT WE WANT

SENSATION (sensed as feelings)

INTENSITY (aware of energy)
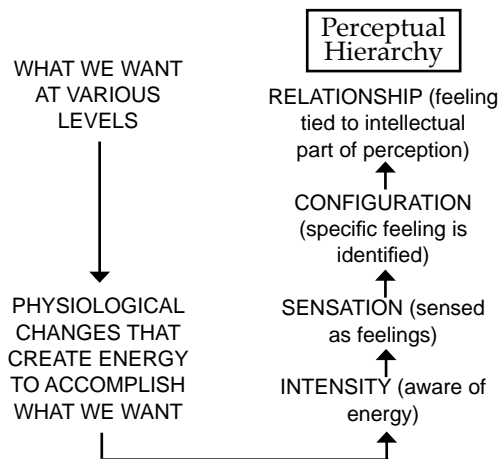
Most people seem to misunderstand the connection between their goals and their feelings. It's as if they can't tell the difference when they feel something with a thought component in it—they think the thought is coming from their bodies. They'll say, "I feel afraid, I feel upset, I'm stressed, etc." Their interpretation of their feelings has their cognitive goal tied into it, but they don't recognize their control over the cognitive goal. Rather, when the feeling is painful, they blame the feeling over which they don't believe they have control. (When people feel great or are enjoying themselves, they rarely have this problem.)

If people would only reflect on their goals, setting aside their feelings, evaluate these goals at all different levels, and try to resolve the problems that lie therein, then the feelings would take care of themselves. Once we achieve a goal, we feel relieved, we're enjoying ourselves, we're laughing, then the energy to achieve what we want is no longer necessary. If there is a need to maintain what we've achieved, then a proportionate amount of energy will be provided by our system. The feelings we experience when we are *unsuccessful* in trying to satisfy a goal are the ones that mostly concern us.

Feelings are really a person's views of what's happening in his or her body. For example, say you feel "all keyed up." That feeling may not be precise, but it gives you a pretty good picture of what's going on within you. You get sort of an overview of your present physiological condition and cognitive state—what you call your feeling state. There are some really major feeling states, such as being elated or being depressed; these probably feel quite different, one being "up" and the other "down," giving specific hints as to the kinds of goals we have.

There are various transient states when a feeling is suddenly building up or suddenly going away, which we call emotions. For example, a woman enters her house, hears someone in the kitchen, recalls a newscast concerning a neighborhood rapist, and begins to panic. Then her eight-year-old daughter appears, showing a big smile, and says, "Hi Mom, we got out of school early today." The woman goes from the relaxed state of wanting to be home to sudden fear to unexpected relief.

Since our wants and goals are the determining variables in relation to our feelings, they also determine our emotions, which are nothing more than very pronounced feelings. The woman's perception of impending danger, imagined or real, and the goal of protection at all costs, created within her a sudden perceptual difference. Emotions are produced when there is an abrupt change in a perceptual difference, whether it suddenly opens up, as when the woman imagined a rapist in her house, or when it snaps shut, as when her daughter appeared with a smile on her face. In the latter case, it was the sensed-fear-type energy that had been generated by her desire for safety. Because the perceived danger passed didn't mean the energy was gone. The emotions of fear and subsequent feeling of relief lasted until the energy she had generated had dissipated within her system.

There are times when we produce lots of energy which we don't use up. For example, if a man is criticized by his boss in front of his peers and desperately needs his job, he would undoubtedly have a great desire to deal with his boss, but would hold back because of a higher priority, namely to keep his job. However, he would still create the hostile energy through his unfulfilled desire to deal with his boss. If he didn't use up that energy in a safe and productive way (such as taking a long run or walk), he might expend it instead by yelling at his wife or the first child he sees as he enters his house after work.

The feeling state also has within it a hint of what your goal might be. For example, "I feel afraid" may indicate your belief that you might not be able to handle something that could harm you. Or "I feel upset" may indicate your belief that what people are doing around you isn't to your liking.

As I mentioned earlier, when you set a goal, you initiate the actions within your physiological organism which produce the energy to achieve that goal. Now, what you sense if you are indeed feeling "all keyed up" is that your heart rate has increased, your breathing has become deeper, adrenaline has entered your bloodstream, the blood has pooled toward the center of your body, etc., etc. You are ready to do something. The cognitive side of you chooses a specific action which ultimately uses up the energy you've generated through having created the goal. Once the energy is used up, you calm down. It takes time to recover.

If you achieve your goal, you'll feel great. If you don't achieve it, you'll return to the same physiological state as before, with the same feelings. Why? You haven't satisfied the goal. It's the unsatisfied goal which returns us to the physiological state and feeling awareness. If I still want something, I'll still continue to produce the necessary energy to accomplish my goal. That continual outpouring of energy is perceived as feelings. Most people don't understand this critical point. The key in all of this is to examine the goal and work out a plan to achieve it; then the feelings reflecting the unachieved goal won't return.

Most therapists, and people in general, deal with feelings without separating the cognitive goal from the feelings. Many are aware of the cognitive element in feelings but do not perceive the distinction between the goal and the feelings, and deal with the feelings as entities in themselves.

Feelings are often seen as a disease—something to be eliminated. People are taught to "express" their feelings by talking about them or physically acting them out. This, it is believed, is a way to get rid of them. The environment (including job, spouse, and/or other people) is often used as an excuse for an individual's feeling state. And when, by chance, full relief from unwanted feelings is finally achieved, the act of dealing with the cognitive element is rarely given credit.

Whether you are counseling or just trying to deal with personal problems, the key to dealing effectively with how you feel is to take a look at what you want and how you perceive things (including your actions), evaluate your system, commit to resolving issues, and then develop and commit to a plan that will restore harmony to your internal control system. Others may help us learn how to deal with our system, but, ultimately, it is our system, and we are the only ones who can effect a change.

This explanation of feelings reflects the many conversations I have had with William Powers. An earlier version of this paper was presented at the second annual meeting of the Control Systems Group, August, 1986.

(Note: Ed Ford teaches at the Graduate School of Social Work, Arizona State University, Tempe. He also has a private counseling practice, and is a consultant for social service facilities and businesses. Ed has authored seven books; his latest, *Love Guaranteed: A Better Marriage in Eight Weeks,* scheduled for publication by Harper & Row in April, 1987, includes a detailed explanation of Control Systems Theory, with a Foreword written by William Powers.)

A Moving Conversation

By Lawrence William Goldfarb (Mind in Motion, 4475 24th St., Suite One, San Francisco, CA 94114.) Copyright 1986 by Lawrence William Goldfarb.

In this article, I would like to discuss the application of cybernetic theory to the study of human movement. My interest in understanding movement is not only theoretical and abstract—as a Feldenkrais practitioner, I make my living by teaching individuals how to overcome chronic pain and neuromuscular difficulties. The Feldenkrais Method (1) is a profoundly effective system of neuromuscular re-education that has a historical commitment to the application of cybernetic theory to the project of improving human functioning.

William Powers' Control Theory (2) develops a formalism about the relationship between perception and motion. Every human action is seen as the expression of a purposive behavior that ends when it reaches an outcome—the achievement of a specific state of affairs. This specific state of affairs, known as a reference state, is achieved only by the means of generating behaviors. The nervous system generates bodily actions until the reading of the monitored variable matches the referent. To state it simply, behavior is the control of perception.

Control Theory says that the concept of a motor program, the basis of the standard research approach, confuses a behavior with an outcome. The motor program approach argues that behavior, a specific set of movements, is equivalent to the outcome. Further, it states that perception is what the nervous system uses to guide, or control, behavior. On the other hand: "Control theory says that organisms are organized to produce internally selected perceptions... The organism acts to bring under control, in relation to some reference state, the sensed perceptions." (3) Therefore, the outcome is not the behavior, not the execution of a motor program; the outcome is the control of a perception. (This also means that, from a cybernetic perspective, behaviorism cannot be a valid explanation of behavior, because human beings and other organisms don't react to stimuli, but, rather, act to control internal variables.)

Posture as a referent, or goal, according to Powers' hierarchy of control, is controlled by means of monitoring and adjusting the effort that specific muscles make. In this model, position can become the means of guiding motion, the level that encompasses posture. This illustrates how what is a *purpose* at one level is a *means* for another level that encompasses it and defines it as a variable. Effort, in turn, is controlled by adjusting the tension in a muscle or group of muscles—tension being the variable used to control for effort. Feedback control of muscular tension, and therefore of effort, is carried out by alpha-gamma motor innervation. (This negative feedback circuit is, interestingly enough, the accepted neurophysiological explanation of this level of organization.) Changing any of these reference levels, by altering the perception that is controlled for, changes the setting of the variable and generates behavior.

During my training in the Feldenkrais Method with Moshe, as Dr. Feldenkrais preferred to be called, he pointed out a phenomenon that provides an interesting example of the behavioral control of perception. Moshe said that if he attempted to *directly* teach someone how to improve their posture, a "funny thing" would happen... Moshe would look at how the person was standing, and compare the actual postural arrangement to an imaginary plumb line dropped from the ear. Let's imagine that the subject was a man leaning forward—with rounded shoulders, and upper back and neck curved forward. Moshe would gently guide him to stand so that the plumb line would pass through the center of his ear, his shoulder joint, his hip joint, his knees, and just a little bit forward of his ankle joint. However, the subject would then report feeling very off-balance, as if he were falling backwards! He would describe a feeling of leaning backwards, twice as far off-center as he previously appeared. And he would proceed to return to his former posture, described by him as more comfortable and "straighter."

How can this "funny thing" be explained?

In the terminology of Control Theory, the subject's previous stance was due to his controlling for the reference perception that defined standing up straight in terms of specific sensory variables. The new posture was experienced as leaning back because the old referent was still in operation. The person's experience was constructed from the feedback comparison of his new location to that postural referent. He acted to control for that perception of being off-balance by standing up "straight," like he normally did, thereby getting rid of the error signal. In this instance, Moshe was acting as a disturbance in the person's control of his posture, evoking an error signal that the person acted to correct by generating behavior to counteract the perceived error.

This experiment demonstrates how the nervous system functions as a control system, generating behavior to control for a certain perception. You can easily reproduce this experiment with the cooperation of a friend, and I encourage you to do so. However, do be gentle if you try it—remember, you're not only demonstrating the applicability of an abstract model, you're directly interacting with the organization of someone's body.

The experiment also may evoke the question, "How could such a model of the nervous system ever explain learning?"

Control Theory argues that the nervous system is informationally closed. The existence of a controlled variable alone can't explain the behavior. Since an internally-set referent must exist in order to guide how the person acts in controlling a variable, perception can only be understood as being *constructed* within the nested sensory-motor control loops that control for that referent. Therefore, to speak of learning as "transmission" of information from one person to another would be misleading, since information, or perception, only arises in the behavioral control of a set reference. In terms of this model, where can new information come from?

For example, I remember that whenever I visited Alice Ostrowsky, my mother's mother, founder of one of France's first modern dance companies, she would sternly remind me to sit up straight at the dinner table. Wanting to be a good grandchild, I'd follow her suggestions and stiffly assume the uncomfortable position she guided me to. As soon as her eyes moved on to another subject, I slumped in relief. Since I was unwilling to give up my personal comfort in return for maintaining good posture, my "reference structure" was unaffected and my posture continued as it was, except when my grandmother was around. Being told to sit up straight did nothing to make any lasting change in my posture.

Can the process of learning a new posture be understood in the context of Control Theory? Powers refers to learning as "re-organization," almost echoing Moshe's conceptualization of his work as re-organizing the nervous system. Control Theory allows for this phrase to be understood as an *alteration of reference levels*, rather than misunderstood as changing the actual structure of the nervous system. While the change in the control process no doubt has physiological correlates, attempting to find them at this stage of our understanding often leads to simplistic arguments such as those about the localization of function.

When considering the idea of "learning as re-organization," one must ask two questions: "*What* is re-organized?" and "*How* is it re-organized?"

What? Rather than defining a complex reference, such as posture, along the single dimension of one variable, I suggest defining it as multi-dimensional—as a configuration of multiple variables.

I propose that posture, for instance, is not controlled along the dimension of muscular effort alone; rather, posture is the configuration that emerges from the control of effort *as well as* other factors such as pressure (the distribution of weight on the feet) and spatial configuration (the perceived relationship of body segments). It is important to note here that, in my teaching experience, different individuals attend to and control for various

constellations of these variables. Therefore, in order to know what to re-organize, in the instance of teaching improved posture, the teacher must have a means for assessing the configuration of the student's present referent for erect posture.

In the process of learning, what is re-organized is the learner's configuration of the guiding referent.

How? In order to understand how this re-organization—this learning—comes about, it is necessary to make a distinction between learning and doing. Doing, performing a certain behavior to control for a specific perception, presupposes that a referent has been established and can be achieved. Learning, on the other hand, requires that the nervous system identify each variable required to control for a specific perception, that it develop the ability to calibrate along each of these dimensions, and that it coordinate these dimensions into the appropriate configuration.

Thus a perceptual configuration arises, or is assembled, with developing control of the substrate dimensions, or variables, that define it. While behavior is controlling, according to a referent, for a certain perception, learning is the *constructing* of that perception. (It would be expected, therefore, as Powers states, that "clear evidence of control does not appear until learning is essentially complete." (4))

Returning to the example of learning a new posture, the definition of learning as re-organizing sensory configurations can now easily be demonstrated. As a Feldenkrais practitioner, I would begin to teach a student to develop a different stance by leading him or her to construct a new configuration: learning what to notice and how to affect what he or she notices. Even if students *want* to improve their postures, if they don't know what to notice (which variables to attune to), or if they don't know how to move themselves to stand differently (which behavior will affect the behavior), they *won't* be able to improve their postures.

I might start by having a student calibrate the relationship of the placement of various body segments to patterns of pressure on the bottoms of the feet. Moshe's student, who was slouching forward, would begin to notice that his weight was mostly on the balls of his feet. Next,

I might have him attend to the amount of tension in the extensor muscles in his back, neck, and calves, beginning to guide him in varying the work those muscles do. Continuing along such a path, I would have him attend to the amount of tension in the extensor muscles in his back, neck, and calves, beginning to guide him in varying the work those muscles do. Continuing along such a path, I would have him attend to the variables specifying the configuration we label "posture," suggesting how to interpret the signal and guiding him in gaining the refined ability to regulate and coordinate those variables.

In this way, as the teacher, I can enter the sensory-motor loop that controls the student's posture. I can enter the loop in many different ways: with my words, using funny sounds as analogs to the movements I'm describing, using a skeleton for illustrating certain structural principles, scribbling hand-drawn sketches, pointing out what I see in a mirror in order to relate it to how the student feels, and, most importantly, using my hands to guide moving and sensing.

Please note that while this example illustrates my point, it does not touch the complexity of the work I do; after all, I am not a stillness teacher, I am a movement teacher. The process that underlies the development of motor competence, the correlation between sensory acuity and movement, is, however, the same on the formal level: re-organizing the perceptual configuration that a movement is. The significant difference in teaching movement, rather than posture, is that the referents are dynamic. That means that the variables constructing a movement track how it changes through time and space, as well as where it is at any particular time. Therefore, in learning the organization of a movement, the student is instructed to attend to and regulate one of the sensory components that determine the movement: its substrate positions,

its direction, its continuity, the amounts of force used, the nearly simultaneous adjustments the rest of the body makes, etc. The teacher engages the student in what is fundamentally a kinesthetic dialogue, a moving conversation.

I have used teaching posture to highlight the contribution that cybernetics and Control Theory can make to understanding learning—the teacher acts to refine, amplify, and coordinate the student's feedback. The teacher does not have to introduce error. In essence, a teacher's job is to define an outcome in sensory-based terms, assessing the student's ability to make the necessary distinctions, and then to guide the student in learning what to notice. The teacher "joins" the sensory-motor loop, teaching the student new skills by introducing refined distinctions, organizing new sensory configurations, constructing new perceptions.

References

(1) Moshe Feldenkrais, *The Case of Nora,* Harper & Row, New York, 1977, and *Body and Mature Behavior,* International Universities Press, New York, 1949. The term "Feldenkrais Method" is a registered mark of the Feldenkrais Guild (Main Office, P.O. Box 11145, San Francisco, CA 94109). For more information about the Method, contact the Guild or the author of this article.

(2) William Powers, *Behavior: The Control of Perception,* Aldine, Chicago, 1973.

(3) William Powers, "A Cybernetic Model for Research in Human Development," in Mark N. Ozer, ed., *A Cybernetic Approach to the Assessment of Children,* Westview Press, Boulder, 1979, 26.

(4) William Powers, op. cit., 58.

Control Theory and the Smithian Economics

By W.D. Williams (1850 Norwood, Boulder, CO 80302). Copyright 1986 by W.D. Williams.

With the development of control theory, for the first time, organic behavior has become a phenomenon which can be subject to an orderly analysis. Control theory provides the only available explanation of purposeful behavior which integrates the full range of phenomena termed organic, including, of course, those behaviors which have been termed mental. The analysis of behavior provided by control theory has fundamental implications for all fields concerned with human experience; here the inquiry is limited to considering some implications of control theory for economic analysis, including a critical survey of the state of contemporary economic theory. My experience indicates that such a preface is necessary if confusion is to be avoided. The source of the confusion which has accompanied attempts to apply control theory in economics has been the belief that control theory can be employed as a complement to and extension of conventional economic theory. To dispose of this mistaken belief, I need to examine in some detail the characteristics of orthodox economics.

The pattern of thought characteristic of contemporary orthodoxy in economics is a direct descendent of the 18th century Cartesian economic worldview, in which behavior is considered to be an input-output process in an economic context. This orthodoxy received its first definitive expression from Adam Smith in 1776. Smith's *Wealth of Nations* described "a simple and obvious system of natural liberties" in which market forces directed human activities in the economic order. The development of a commercial market society was well underway in Smith's day, and consequently his conception of such an economic order and justification of it found ready acceptance. Smith's initial formulation had the appeal which Descartes attributed to "clear and distinct ideas." However, as economic theorists since Smith have discovered, the conception of the economic order which

Smith thought to be "simple and obvious" contains many logical difficulties. Current attempts to attain logical consistency, while retaining Smith's basic conception, are anything but simple and obvious.

The reader unacquainted with the contemporary mode of presenting "choice-theoretic economics" might scan through Gerhard Debreau's slim volume *The Theory of Value.* The question of how Debreau's mathematics relates to an actual economy is one by which Debreau himself is more than a little mystified. However, as an economic theorist, he handles the problem concisely by the preliminary statement "We assume..."

More important than the baroque and non-evidential turn of economic theory is that the actual economic reality which the Smithian conception purports to describe exhibits a number of significant anomalies. These anomalies include unfortunate processes such as involuntary unemployment, inflation, exploitive monopolies, and distortions in international trade. But it should also be understood that the processes of economic growth and development are just as poorly captured by the orthodox economic conception as are the unfortunate anomalies. This shouldn't be too surprising. The Smithian conception is more than two centuries old, and it would be astonishing if a body of theory of such relative antiquity, as scientific formulations go, were a completely adequate formulation of economic reality. It should not be expected that an economic theory developed before an accurate comprehension of behavior was available would be sufficient for all purposes and all time.

However, as even its most vehement critics, such as Karl Marx, observed, the commercial/industrial mixed economies of partially free societies, with which the Smithian formulation is associated, are immensely productive. In addition, it ought to be recognized that, compared to alternative economic arrangements such as feudalism, communism, or fascism, such societies provide relatively orderly and just contexts for life. The burden of responsibility for modification of "free-market" societies and for criticisms of the socioeconomic theory that supports them is a heavy one.

Of course, it isn't difficult to find fault with *particular* features of both modern commercial/industrial societies and their theoretical justifications. Deficiencies in practice have been indicated by Ida Tarbell, Upton Sinclair, Rachel Carson, Ralph Nader, and others. Theoretical deficiencies have been discussed by, for example, Thorstein Veblen, John R. Commons, Rex Tug well, Scott Nearing, John Maynard Keynes, and, more recently, John Kenneth Galbraith, C.E. Ayres, Gunnar Myrdal, and Joan Robinson.

The difficulty which such critical efforts have always experienced has been that of how to *justify* social controls which would regulate the excesses and correct the deficiencies occurring in commercial/industrial societies. The opponents of such regulatory intervention in the economy have countered the criticism of both theory and practice by pointing to the lack of a comprehensive theoretical foundation for such intervention. They assert that critics of orthodox theory and the commercial/industrial order it justifies propose no alternative theoretical construct or general social principle to replace the conception of the economic order developed by Smith. And they assert that in the absence of a theoretical basis for "social tinkering" with the economic order, interventions are likely to be mischievous. Obviously, some tinkering has had mischievous results. But, criminal misconduct aside, there is no generally recognized and fundamental theoretical basis upon which to justify or evaluate the effectiveness of government intervention of any kind in the economic order. The technique known as cost/benefit analysis is well known, but it ought to be understood that the technique *assumes* that market valuations are fundamentally correct. Thus, the exercises in which cost/benefit techniques have been used to justify interventions which change the allocation of resources are internally paradoxical: if the distribution of resources generated by a market is correct, there is and can be no basis for justifying interventions in the market which would change that distribution.

The orthodox economists are quite correct in their charge that the critics have lacked an explicitly stated theoretical alternative comparable to the structure of Smithian economics. But, in supposing that no adequate theoretical alternative can ever be developed, they are mistaken. Their mistake arises from two sources. First, they are unable to conceive of the possibility that their own conception of human behavior might be fundamentally mistaken. Second, they are firm in their belief that the development of a fundamentally new and more adequate conception of behavior is impossible. They come to this conclusion because they believe that the structure of logic itself is the foundation of their analysis of economic behavior. The orthodox conception of behavior is one in which an economic agent responds to price "signals" by attempting to minimize costs and maximize benefits. When one is a graduate student in economics, if one is fortunate, a candid professor who is not a "true believer" will let slip the dark secret that perhaps all is not well within this theoretical system, and that it may never be possible to attain closure and consistency within the orthodox context.

Orthodox economic theory in its contemporary expression is presented as a theory of choice. (To avoid a review of the whole pattern of economic theory, the discussion here will be limited to the orthodox treatment of consumer choice.) The elements of this formulation of choice are (1) an abstract quantity sometimes labelled "utility" and (2) optimization algorithms. The description of consumer choice is then considered in terms of a detailed examination of the nature of utility and of problems, typically of a mathematical sort. The ostensive point of these exercises is the development of a genuine description, of scientific character, of consumer behavior in the marketplace.

A skeptical mind, however, may experience some difficulty accepting this self-description by the economists of their own behavior. The list below refers to some of the grounds for doubting the adequacy of the orthodox conception of behavior in an economic context:

1. The fundamental unit of "utility", in terms of which choice is supposed to be made, has never been identified successfully. Neither has the proper assignment of even its abstract properties been made. Some believe that utility ought to be represented by a "cardinal" number — they believe that utility has absolute units. Apparently, they might expect to find "atoms" of pleasure. Others believe that an "ordinal" representation is proper, because they believe that utility should be relative. Cassel in 1925 recommended dropping the concept of utility altogether, because he judged the construct inherently unquantifiable. The past half century has yet to prove him wrong. But the inability to measure utility experimentally has not, to any noticeable extent, altered economic doctrine. The question of how utility is to be measured has practical significance for everyone in that the price level indexes are supposedly constructed using the choice-theoretic formulation of orthodox economics. "In theory," a price level index ought to be constructed using a process exactly analogous to the process used by the Bureau of Standards for determining standards of weights, measures, and time. Actually, the relationship between orthodox choice-theoretic economics and the actual price indexes published is wholly ceremonial, with no genuine theoretical foundation.

2. It is often implicitly assumed that economic theory is concerned with the life process. But the orthodox formulation is not, and demonstrably cannot be, a description of a life process. If the process with which economics is concerned is a process of choice by a living consumer, then the orthodox construct is *completely inapplicable*. For the orthodox economist, the pattern of correlations between goods consumed and the supposed (though unidentified) resultant magnitudes of utility has no explanation. The lack of any explanation of the pattern of utilities is often obscured in casual expositions by resort to an extra-analytical assumption that

the construct utility incorporates what "common sense" would assume it contains—physiological needs, cultural expectations, and institutional requirements. But no consistent scheme has been offered to connect these elements to utility. Psychologists might note a correspondence here to the situation in behaviorism, in which there is no explanation of why a reinforcer should be a reinforcer.

To repeat the observation made in section 1, the fundamental unit which is assumed to govern economic behavior has *never* been identified or measured. To connect the phenomena which are ordinarily considered to have economic significance to the analysis would be a difficult task; first, one would have to identify "utility" before *anything* could be connected to it.

3. Leaving aside the difficulties connected with the fundamental determinants of behavior as conceived in the orthodox analysis, there are additional difficulties which are inherent in the fundamental structure of the analysis itself—even if it is considered a *purely speculative* construct.

As the professionalization of orthodox economics progressed, and the Smithian construct was given progressively more mathematical expression, it became increasingly evident that a consistent formulation of the orthodox conception of an economy would be a very restricted one. The maintenance of logical consistency, it became evident, requires a set of bizarre assumptions, which may have reached a (temporary) zenith when the theorist was compelled to assume that a market contained more than an infinite number of firms in order to obtain the desired conclusion. Other absurdities required by the orthodox construct include the assumption that every individual is wholly rational and completely accurate in calculating and carrying out an optimum behavior. If any element in the structure deviates from perfection, there is no way, in general, to predict how far the economy as a whole will depart from an optimum condition (this difficulty is considered under the title of the "theory of the second best"). A further implication of the necessity for assuming perfection on the part of the persons who make up an economy is the assumption that either all individuals know the future in exhaustive detail, or that all future existence is exactly like the present. This means either that the theory is inapplicable to the real world, or that there has been no history.

4. If the above difficulties were not enough, the construction of the theory compelled the assumption that the only determinant of economic behavior resides exclusively within the individual and in the prices existing in the market. If individuals were influenced by their neighbor's behavior, the consequences could not be calculated by orthodox methods of analysis. This feature of conventional economic analysis has been given succinct expression as "Individuals are molecules and society is a gas." If people influence each other to any extent, the structure of the analysis collapses.

The difficulties in the orthodox position as outlined above are not exhaustive, but they should suffice as hints of the extent and severity of problems contained within the orthodox conception. The critical literature on economics is not particularly accessible, and what is available is not of uniform quality. Many of the critics have experienced difficulty in avoiding becoming confused, and either implicitly or explicitly assuming the validity of portions of the orthodox theory (see, for example, Koran's *Anti-Equilibrium).* This situation has resulted, at least in part, from an alternative construct in economic thought which explains behavior in the context of market exchange and *limited resources*. It might be expected that one effect of the appearance of a viable alternative to the orthodox theory would be an increased willingness to subject economic orthodoxy to a critical examination (see Suffield, Tool, Mishap, and Either for recent critical studies of the orthodox position).

If economic behavior is considered as a *physiological problem of sensory-motor coordination in a context of ecological viability*, the fundamental problems of economics can be seen in a new light. The significance of this new conception is illustrated by the change in the theory of consumer demand required by it. The fundamental characteristic of the orthodox conception of consumer demand is that a consumer should respond to an *increase* in the price of a good by purchasing *less* of that good (other things remaining unchanged), and should respond to a *decrease* in the price of a good by purchasing more of that good (other things remaining unchanged). This is a crucial aspect of the orthodox formulation. It is a *necessary* feature required to insure the *stability* of prices in a "self-regulating" market. There is in the orthodox theory no more fundamental assumption than that consumer demand will decrease purchases in response to price increases, and will increase purchases in response to price decreases.

However, since the turn of the century, orthodox analysts have been aware that there is a case, the *Giffen Effect*, which has been termed "paradoxical," in which an increase in price might be expected to produce an increase in the quantity purchased (cf. Alfred Marshall's *Principles of Economics,* third edition or later). One circumstance in which this Effect might occur, it has been speculated, is that where a low-income consumer spends a large fraction of his or her income on bread. This consumer would prefer to purchase and consume more meat. However, the need for calories and budget limitations prevent this. In this situation, it can be seen readily that an increase in the price of bread will result in either (1) the purchase of *more* bread, (2) starvation, or (3) modification of the situation in some way. A consumer who behaved in conformity with the orthodox specification would reduce the purchase of bread in response to the price increase. That this leads to the consumer's ultimate starvation has generated some perplexity among orthodox theorists, but it has not yet led them to reconsider either their theory or their definition of rationality.

Consider a consumer with a limited budget, a physiological requirement for a specified number of calories, and a preference for a given quantity of meat. Suppose that the consumer's only nutritional requirement is that for calories. The consumer's situation can be depicted by the graph shown below. The quantities of bread and meat that the budget will buy, the quantities of bread and meat that will supply the necessary calories, and the quantity of meat desired are plotted on the graph. The consumer would like to buy more meat, but the :non-? urgent need for calories and the brute reality of the budget prevent this. As shown in the graph, an increase in the price of bread will require the consumer to purchase more bread to meet the physiological requirement for calories. (The computer program, listing, in Microsoft (TM) BASIC, is the algorithmic counterpart to the graph.) In the case of the Giffen Effect, the demand curve for bread slopes upward to the right—the higher the price of bread, the larger will be the consumer's motive for the purchase of bread. An upward sloping demand curve represents the possibility of an *unstable* market: if a higher price increases the motive to purchase still more of a good, this in turn may generate a further increase in the good's price, and the process runs away from, rather than toward, a stable equilibrium.
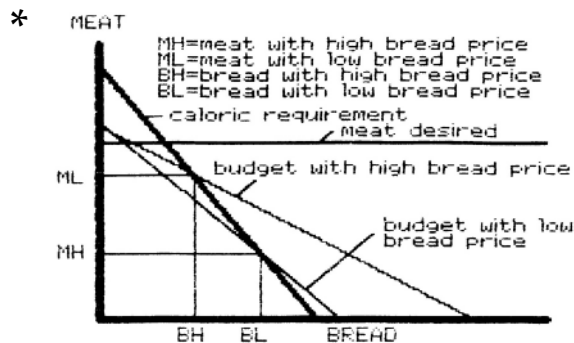
*For erratum regarding this graph, see CC number 8, page 8.

How is this situation to be explained? Not in terms of economic orthodoxy! The problem has been well known within the inner circles of the profession for over three-quarters of a century. But the answer has been one of denial and evasion. (See Alchian's discussion of the Giffen Effect in his nearly 1000-page *University Economics* text. Actually, there is no discussion of the Effect in the book.) If behavior, including economic behavior, is considered in a *control theory* analysis, the problem presented by the Giffen paradox can be handled quite nicely without hand waving and shouting. If we consider behavior as a coordinated structure of controlling (and controlled) loops, it is obvious that some requirements are more urgent than others. Meeting the need for oxygen is one of the most urgent; the need for water is less urgent; the need for calories is still less urgent; and so forth. Instead of positing an undefinable abstract entity called "utility" which governs behavior, a great number of clearly definable requirements can be, and in fact have been, specified. The most basic include the consumption of gases, liquids, salts, and sugars to maintain the blood in a condition which supports life. Under the heading "homeostasis," Cannon and others explored the physiological mechanisms which, given an appropriate environment, control behavior so as to maintain these conditions. Wiener employed control theory as an explanation of sensory-motor behavior. More recently, Monod and Jacob demonstrated that precisely the same control principles direct behavior at the biochemical level within *cells.* Powers has extended the application of these principles to complex behaviors.

Returning to the Giffen Effect, the pattern of behavior which has so puzzled the orthodox economists can be described as a situation wherein the interactions of several control systems produce unexpected results. The budget is a part of a symbolic legal-cultural system that authorizes violence to maintain a set of coordinated behaviors -one pays for one's coffee, or one goes to jail. Within this context, the urgent requirement—the physiological need for calories—supersedes other goals which the budget empowers the consumer to pursue. The Giffen "Paradox" is simply a result ,)f a situation in which a good's price increase compels a consumer to purchase more of the good. There is nothing *genuinely* paradoxical about the situation. What is paradoxical is the continued application of an incorrect analysis to the problem. The orthodox analysis provides neither the "correct" answer nor an explanation of *why* the consumer is behaving as he or she actually behaves.

This discussion of control theory analysis as an alternative to orthodox economic analysis has provided only a preliminary indication of the potential for recasting economic theory. Instead of attempting to summarize developments which are incomplete at this point, I instead invite comments, so that this initial statement might be extended as a conversation.

```
10 ' STATIC SEQUENTIAL GIFFEN EFFECT
20 ' BY W.D. WILLIAMS - DECEMBER 1986
30 '
40 ' NOTE:THIS PROGRAM IS MAINLY FOR
50 '       ILLUSTRATING THE EFFECT
60 '       IN ALGORITHMIC FORM -
70 '       CONVERGENCE TO EQUILIBRIUM
80 '       IS VERY SLOW (!) AND
90 '       IT WILL NOT BE REACHED
100 '      WITH SOME VARIABLE VALUES
110 '
120 ' DEFINITIONS:
130 ' M:QUANTITY OF MEAT CONSUMED
140 ' MD:QUANTITY OF MEAT DESIRED
150 ' RE:ERROR EXPERIENCED IN MEAT DESIRED
160 ' L:QUANTITY OF BREAD CONSUMED
170 ' MP:PRICE OF MEAT
180 ' LP:PRICE OF BREAD
190 ' MC:CALORIES PER UNIT MEAT
200 ' LC:CALORIES PER UNIT BREAD
210 ' B:BUDGET
220 ' I:EXPENDITURE
230 ' W:EXPENDITURE ERROR
240 ' C:CALORIC REQUIREMENT
250 ' K:CALORIC CONSUMPTION
260 ' E:CALORIC ERROR
270 '
280 ' ASSIGN VALUES TO INDEPENDENT VARIABLES
290 '
300 MD=2.7:MP=900:LP=200:MC=250:LC=3000:B=1000:C=2400
310 '
320 ' M=0 AND L=0, INITIALLY
330 '
340 ' LOOPS BEGIN
350 '
360 I=MP*M+LF*L
370 K=M*MC+L*LC
380 PRINT " "
390 PRINT "M="M"    L="L"    I="I"    K="K"    RE="RE
400 PRINT " "
410 W=(B-I)/1000
420 E=(C-K)/1000
430 RE=MD-M
440 '
450 IF W<-.001 THEN GOTO 510
460 IF ABS(E)>.01 THEN GOTO 530
470 IF ABS(RE)>.01 THEN GOTO 550
480 '
490 PRINT "EQUILIBRIUM":END
500 '
510 MD=MD-.0001:M=M+W
520 PRINT "BUDGET LOOP":GOTO 360
530 L=L+E/100
540 PRINT "CALORIC LOOP":GOTO 360
550 IF RE<0 THEN M=M-.001
560 IF RE>0 THEN M=M+.001
570 PRINT "PREFERENCE LOOP":GOTO 360
```

Legitimacy of Subjectivity

By Dr. Miro Valach (Dept. of Engineering, San Jose State University, One Washington Square, San Jose, CA 93192.) Copyright 1986 by Miro Valach.

It is clear that dichotomies matter-mind, body-spirit, etc., are, indeed, white and red filters of our culture, as was pointed out by Bechle, Cashman, and Dunne in *Continuing the Conversation* #6. I feel, however, that this phenomenon of our perception is not carried out far enough. What seems to be missing is that, as human beings who *cannot think any other way than subjectively*, we are not in any dichotomy under all circumstances or at all times. A dichotomy is only a small and occasional part of us.

To be short let me state that I am prepared to defend the subjectivity of thoughts in the sense that my thoughts are part of me. Their externalization does not make them necessarily objective. Also, my—and therefore subjective—evaluation of so-called objectivity of my thoughts does not make them objective, nor does evaluation by anyone else, unless the objectivity is understood in relative terms, i.e., in relation to some kind of a frame of reference or context, if you will. In this sense objectivity is relative (local) and I am the context or reference system of my thoughts. They simply carry my scent.

It is obvious that we do not carry the reality in our minds. We carry just its image, without knowing in fact what the actual reality is like. We manipulate these images (representations of the reality) and they are the only things we cognitively (as opposed to intuition, beliefs, feelings, etc.) know about reality. The representations are limits beyond which we have so far not succeeded in grasping.

Does it matter? It does not matter that much. It helps to have a proper or relevant image of reality. But how many discoveries were based on an inadequate or improper understanding of the discovered matter? How many times has a goal been reached with a wrong map? How many times has a body been healed without the slightest understanding of the healing process and actual workings of the medicine, or *in spite of* the help provided? How many eloquent speakers have precise formal knowledge of the grammar of their language? What model of the environment has an insect that carried a piece of rock, lost it, and found it again by random coverage of the territory?

We create our goals with the sense of purpose that provides a measure of how successfully the goal has been reached. As long as the subjective satisfaction has been achieved from reaching the goal it does not matter whether or not getting there happened by a planned, elaborate, or wrong action, objectively, subjectively, completely, partially, or even as an illusion.

The essential part seems to be our subjective subconsciously monitored satisfaction invoked by the match between what we have expected to happen as a consequence of our actions and what has actually happened. This match can be achieved by an actual reaching the goal, by pretended achievement, by an illusion of an achievement, or by any subjectively acceptable interpretation of reality. In the drive for getting the match at any price, our mind will accept even fooling itself, making up excuses, changing the goal or expectation and pretending it was the original intention, and so on. (See psychology, psychiatry, and history, elsewhere!)

The point is that a single person is a multiplicity of philosophies, interpretations of reality, ways of achieving goals, ways of expecting responses to his or her own actions, ways of subjective observations, and subjective interpretations. Most of the time in daily life, the objectivity is not an overwhelmingly important subject. The objectivity seems to be, in many cases, a mask worn only on relatively few occasions to achieve particular goals, among which may be just to obtain a sound social status. In fact, it is the subjective side that is essential to an individual to bring about the satisfaction from reaching the expectation/achievement match, and, in a broader sense, in coping with the environment.

How important is it for engineers to know that Newton's laws are invalid in view of the more universal laws of Einstein's relativity? Newton's laws are valid in a limited way in which they serve well to solve numerous engineering (and other) problems. So is individual subjective unrealistic representation of reality in each of us. As long as the particular representation successfully serves a purpose, it does not matter whether or not it fits a broader picture. When this inaccurate, limited, and perhaps far-out model of reality stops serving adequately, it is simply abandoned and replaced. Replaced by something better? Not necessarily!

Subjectively, we are dynamic creatures, and so is everything we create, including our "objective" science. Not all of us (and certainly not at all times) are scientists, philosophers, or professionals. We are "survivalists" first and "understandists" later. There is indeed a difference between having better chances (for example, to survive) with a broader model of reality (or, as we love to say, a more objective one) on the one hand, and actually being objective most of the time on the other hand.

Subjectivity brings yet another facet of the situation that we do not find in the objective picture. Looking at myself from the long-term perspective of my life as a dynamic (observing, growing, learning, maturing) individual, *it is not how much or how precisely I know but how curious I am*.

The conclusion? Two filters, ten filters, or a universal filter, it does not matter! What is important is to clarify what is to be achieved, which of the filters is to be used for which situation, and to see later whether or not the particular goal has been *subjectively* reached to the satisfaction of the expectations. The stress on the subjectivity is important, because it is deeply rooted in the subjectivity of the goal setting, in the subjectivity of the expectations, and in the subjectivity of the conclusion as to the reaching of the goal. The subjectivity can be, of course, that of an individual, a society, or a culture.

To face up to your individual, subjective, realistic or imaginary problem, create the goal, arouse the expectation, mobilize available resources, use them *whatever way possible* to reach the solution, then dissolve the whole thing afterwards, and get ready for the next—that seems to be the common strategy not only for our daily situations, but also for our lives as engineers, scientists, philosophers, artists, individuals, family members—and "survivalists."

A Basic Bibliography of Control Systems Theory

Compiled by Greg Williams.

(Note: This is definitely *not* a complete bibliography.)

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Regarding Bateson and Powers

By Dr. Laurence D. Richards (Dept. of Engineering Management, Old Dominion University, Norfolk, VA 23508). Copyright 1986 by Laurence D. Richards.

   In the last issue of *Continuing the Conversation,* reference was made to the possibility that Gregory Bateson might have been familiar with some of William Powers' work. Rodney Donaldson reports that, to his knowledge, Bateson was not familiar with Powers' work except perhaps through discussions he might have had with Rodney himself, who was reading *Behavior: The Control of Perception* at the time of their association.
   Anyone with additional information on this or other historical points of interest to the cybernetics community should submit it for publication in CC. History has a strange (or not perhaps not so strange) way of becoming distorted to accommodate the purposes of those in the present. It is perhaps safer to focus attention on the interaction of ideas, rather than on the names associated with those ideas.

The Control Systems Group

A good way to keep current on happenings related to Control Systems Theory is to join the Control Systems Group. The Group publishes a newsletter *(Feedback)*, sponsors publication of papers related to CST, and holds annual meetings. The third annual meeting of the Group is scheduled for September 23- 27, 1987, at a retreat near Kenosha, Wisconsin. Membership dues are $10.00 per year ($2.00 for students; no extra charge for joint membership with spouse); send to Ed Ford, 10209 N. 56th St., Scottsdale, AZ 85253. For more information on Group activities, contact Ed or Mary Powers, 1138 Whitfield Rd., Northbrook, IL 60062.

Cassette tapes of presentations and discussions at the second annual meeting of the Control Systems Group (held August 20-24, 1986) are available. Most of these are about 90 minutes long. Please order by number and name of presenter, as given below.

1. Ed Ford ("feelings" and CST)

2. David Goldstein (Q methodology, CST, and psychotherapy)

3. Bill Williams, Side A (CST and economic "paradoxes") and Scott Jordan, Side B ("the behavioral illusion")

4. Larry Richards (CST and the history of cybernetics)

5. Bill Powers (an agenda for the Control Systems Group)

6. Rick Marken (hierarchical computer models for control systems and experimental evidence for human control hierarchies)

7. Ray Pavloski (cardiovascular psychophysiology and CST)

8. Diane Gossen (CST and Reality Therapy)

9. Susan Gulik (CST, musical performance, and "stage fright")

10. Dick Robertson and David Goldstein (CST and the "self"-system)

11. Wayne Hershberger (a "new" type of behavior: control of inputs)

12. Larry Richards (CST and organizational design)

13. Greg Williams (CST models for "organisms" in "environments" suggest that the appropriate units for ethical considerations are neither "organisms" nor "environments", but "units of decision and action")

14. Gail Fleischaker – discussion only ("purpose", "intention", and CST)

15. Sam Randlett (CST and learning to play the piano)

Prices for the tapes are: 1 for $4.00; 3 for $10.00; 5 for $15.00; 10 for $25.00; all 15 for $35.00. Postpaid (4th class) within North America; add $1.00 per tape for airmail delivery outside North America (U.S. funds only). Order from: HortIdeas, Rt. 1, Box 302, Gravel Switch, KY 40328. Make checks payable to "HortIdeas."

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Continuing the Conversation

A Newsletter of
Ideas in Cybernetics

A Question of Values

By Elisabeth H. Thomas (1311 Prospect Ave., Brooklyn, NY 11218). Copyright 1986 by Elisabeth H. Thomas.

In "A Conversation," in issue 6 of this newsletter, Ty Cashman surprised me by saying that "value" cannot be measured. The sentence "All beings have equal value" is nonsense, he says, because value is not a quantifiable substance.

Missing from his argument is the dual meaning of the word "value." "Value" can describe either intrinsic worth or relative worth. The sentence "All life is valuable because it is sacred" demonstrates the former use—that of intrinsic value. However, the concept "intrinsic" implicitly reveals a judge—someone who arbitrarily ascribes qualities to things but believes his ascriptions to be descriptions of obvious truth. Further, the clause "because it is sacred" constitutes an explanatory principle; the whole sentence might as well read "All life is valuable because it is valuable."

In any case, if you believe in "intrinsic" value, then the sentence "All beings have equal value" will sound sensible; it really means that all beings have intrinsic value. Paradoxically, the very ascription of universal intrinsic value erases the implicit judge; once you judge yourself on a par with all other beings, you're no longer in a position to judge anything. (The acts of judging the self of which you are a part and judging the species of which you are a member constitute disregard for different logical types—and, sure enough, paradox is the result.)

Now, the question of "value" to describe relative worth recasts the meaning of the sentence "All beings have equal value." It raises the question: equal value for whom? While I might agree that all beings have intrinsic value, I still attack intruding mosquitoes with Windex and squish them with a Kleenex. I don't know what this proves. It proves that I am inconsistent. It may explain why I laughed so hard when I read, in George Orwell's *Animal Farm,* that "all animals are equal, but some are more equal than others."

I value food because it fulfills one of my immutable, biologic needs. But, already, this idea of value is fraught with ambiguities. When I am acutely nauseated, I do not value food; or, do I value it hypothetically, since I presume I won't remain ill? With the former evaluation, my perspective is grounded in the present; my perspective is directed toward the future with the notion of hypothetical value.

Lima beans make me sick. I do not value them as food. But, I think they're kind of cute. What does this prove—that they have intrinsic cuteness value?

I value my crutches, when I want to walk somewhere. My landlord doesn't value them at all—not even on my behalf. When seated, I could say that my crutches have no immediate value (just like my landlord) or that they have hypothetical value. This latter assertion again presumes belief in "the future" and that, for instance, I will not find myself turned mysteriously quadriplegic, five minutes hence, nor find my sprained ankle miraculously healed.

From a third perspective, I might, while seated, say that I value my crutches, absolutely. This might mean either that I believe that all objects have "intrinsic" value or that I like to chew on the rubber tips, whenever I'm not walking.

Attempted rational explanation of non-rational cognition is clearly irrational. Why do we bother with this newsletter, when we'd all be better off finger-painting?

The Twain Shall Meet

By Elisabeth H. Thomas (1311 Prospect Ave., Brooklyn, NY 11218). Copyright 1986 by Elisabeth H. Thomas.

> "Oh, east is east, and west is west, and never the twain shall meet..." Rudyard Kipling, "Ballad of East and West."

> "There is no east or west, here." Slavic Brooklyn matron, giving directions to confused pedestrian (this author).

Quality and quantity do not overlap, according to authors of the article "A Conversation," published in issue number 6. If you think they do overlap, you are exhibiting dualistic, Cartesian thinking, they hint. Their assertions make me feel a great quantity of the reified quality "puzzlement."

These authors say that "hope" is a quality, that one can feel either hope or no hope. The concept of feeling "little hope" is epistemologic nonsense, they write. But I know that, once I start hoping, I can hope a little or a lot.

For me, hoping is a process that is partly willful and partly involuntary. It consists of shuffling through pertinent mental pictures and gazing at the ones I like; I also stick pieces of these pictures into ideal daydreams. If I find myself able to do this easily, I feel that I have "a lot" of "hope." Alternatively, if I keep lapsing into nasty memories or unpleasant hitches in my daydreams, I begin to feel that the "amount" of my hope is dwindling, that I have "little hope." At this point, I usually start feeling anxious and devote more time to shuffling my mental pictures. I begin to face discrepancies between my present reality and my idealized future.

From this perspective, hope can, indeed, be quantified by a formula: the amount of hope varies in inverse proportion to the amount of time—or, perhaps, the amount of concentration—devoted to the process.

I have reified hoping, with my references to "hope," "memories," "pictures," and so forth, as if these constructs were measurable, static "things." Yet, I can also recapture movement (by dint of oxymoron) by asserting that the "amount" of hope really describes the extent of resemblance between my current, mental collage—which constantly is changing—and my ideal. This way, I can see myself as a kaleidoscope being manipulated by a control-mad fool (me) who wants the real toy to match a static, sample pattern printed on the box.

Hope is not a quality, nor is puzzlement. They are time-linked, cognitive processes, in which one can engage with any degree of intensity. Cartesian reductionism robs such processes of their time dependence by classifying them as "qualities," as distinct from "quantities"—and never the twain shall meet. But "there is no east or west, here;" that is, quality versus quantity, when used to describe cognitive process, are philosophic artifacts. They must, somehow, either be ignored or be made to intersect, in order to reflect human experience, at all. A person trying to convey for

how long, how hard, and with what success he has been trying to make facts match ideals is forced, therefore, to speak of the "amount" of his "hope." Although not parallel, this is reminiscent of the nonsense generated by treating a time-dependent, causal, "if... then" sequence as a timeless, logical, "if... then" syllogism (cf. Bateson, *Mind and Nature,* pages 58-59 of the hardback edition, pages 64-66 of the paperback edition).

Through language—English, at least—we unwittingly map processes like hope and puzzlement as mere "abstract nouns." This grammatical category is distinct from "concrete nouns," such as "typewriter" or "cuticle" (although plenty of nouns are murky, such as "essay" and "sprain"). Abstract and concrete nouns are also separate logical types.

Grammatically, any noun may be modified by any adjective. Logically, however, we cannot treat "hope" as a concrete noun and modify it with "little" or "festering;" but, humanly, we must, because the boundaries on the linguistic and logical maps are not representative of their human territory. Since the maps are a mess, we have to transgress, in order to express ourselves. Logically nonsensical figures of speech, such as "little hope," actually compensate for an epistemologically loony language.

But a more fundamental consideration is this: hope, itself, is the product of a dualistic mind. It describes a way of being in which awareness is linked only tenuously with the present moment. Much attention is diverted toward formulating ideals or "goals" (sometimes based on past glories) and to manipulating one's perceptions—and fellow creatures—in order to make facts match fabrications.

Because of the world's ways, I must plan in order to earn money and feed myself; with planning comes hoping and disappointment. But, whereas I used to equate "helplessness" with multiple disappointments leading to despair or panic, I now sometimes equate it with peace. In despairing hopelessness, I feel abandoned by hope; actually, I am rejecting my reality (the present) while secretly clinging to my ideal (the unreal future). Conversely, in peaceful hopelessness, I unburden myself of hope; I come back into myself, into the present moment with all its color, movement, sound, and emotion. I remember how to draw and paint.

When I heard that "there is no east or west" in Brooklyn, I told a Brooklynite friend. "That's true," Sue reflected. "In Brooklyn, we have only 'toward the water' and 'away from the water.'"

"But," I protested, "there's water practically all around!"

"Right," she agreed, calmly. "So, sometimes we say 'toward the cemetery' and 'away from the cemetery.'"

I was prepared to accept this oddity and file it away with the knowledge that Manhattan has no north or south—only "uptown" and "downtown." But my hope for ever mastering New York's idiosyncrasies crashed one day in Greenwich Village, when I discovered the intersection of West Fourth Street and West Tenth.

Behavioral Output *Can* Be Controlled (In a Sense)

By Roger K. Pitman, M.D. (Veterans Administration Medical Center, 718 Smyth Rd., Manchester, NH 03104.) This work was performed by an employee of the U.S. Government as part of his official duties and is therefore in the public domain.

I have been a fan of Bill Powers' Control Systems Theory (CST) since I read (more like devoured) his *Behavior: The Control of Perception* (1973) nearly a decade ago. I feel that CST has yet to make its great impact on the behavioral and clinical sciences. However, I become concerned when I detect the claim that one point of view has a corner on the theory-of-behavior market, as I did while reading Bill's remarks in "On Purpose" in CC Number 7. I've always been distressed by schisms between legitimate approaches to behavior, e.g., as developed in previous decades between psychoanalysis and behaviorism, because the differences are often in emphasis and semantics, rather than in substance, and the apparent contradictions are frequently illusory and resolvable if each side would more open-mindedly try to understand the language of the other. So I am disturbed by the schism evident in Powers' article between behaviorism and CST, and I suggest that much of this schism is semantic rather than substantive.

Powers disputes the notion that reinforcement can cause behavior, and in support of this contention offers a Socratic Dialogue regarding making a child behave better by giving him a chocolate syrup reward. To pursue the Dialogue, suppose I wish my child to pick up his toys. I tell him that if he does so, I'll give him some chocolate syrup. He does it, and I give him the reward. Next day he does it again, and I repeat the reward. Soon I find that he is regularly picking up his toys in order to get the reward. I don't even have to give the reward each time, as intermittent reinforcement schedules may be more effective than continuous schedules in maintaining a behavior. Later, words of approval may substitute for the syrup, and eventually the behavior may become established and persist without any external reward. In CST terms, through my behavioral output of providing the syrup, I have brought my child's behavior closer to my internal reference signal for his picking up his toys, i.e., I have controlled his behavior. At this point, Powers will object that it is not my child's behavior that I have brought closer to my internal reference signal, but rather my perception of my child's behavior. From an orthodox CST viewpoint, this may be a big distinction. However, suppose that several other family members have observed the sequence of events, and it is also their perception (as it no doubt would be, unless I have been hallucinating) that my child is picking up his toys more often. Reality consists of agreed-upon perceptions. If we choose to define behavior as a *process*, i.e., the control of perception, then Powers is correct. But if we choose to define behavior as *agreed-upon perceptions of someone's actions*, the distinction becomes trivial. It's a semantic issue. From one point of view, my child is controlling (his perceptions of) my behavior by emitting behavioral output (picking up his toys) that leads to my giving him the syrup; from another point of view, I am controlling (my perceptions of) his behavior by emitting behavioral output (giving the reward) that leads to his picking up his toys. Which is correct? Both. Powers emphasizes the former; behaviorists, the latter.

Furthermore, by providing a reward, I have caused to exist in my child a behavioral control system that previously did not exist. "Toys picked up" has now become a reference signal for his future perceptions, i.e., he will purposefully pick up his toys in the future, because this perception has become associated with a reward. May not this be considered an example of reinforcement causing behavior? Miller (1985) has shown that a learned conditional stimulus can be reinforcing in its own right, independent of the original unconditioned stimulus. Operant conditioning creates *de novo* behavioral control systems, in that the organism will purposefully strive to reproduce (or avoid) in the future the perceptual state that existed at the time the reinforcement occurred.

The power of reinforcement to influence behavior is illustrated in the aphorism regarding alcoholism, "The man takes a drink, the drink takes a drink, the drink takes the man." When this unhappy state of affairs occurs, we speak of the alcoholic "losing control of his behavior." According to CST theory this cannot occur, but from the clinical standpoint, this characterization is pretty accurate. On the positive side, in the behavior therapy setting, with the help of the clinician the patient may become capable of focusing on (perceiving) his own behavioral outputs, and then shaping them to more desirable reference levels.

The theoretical and clinical advances produced by behaviorism have been so powerful that any aspiring theory of human behavior, including CST, that ignores them does so at its own peril. I suggest that rather than existing in an antagonistic, either-or relationship, CST and behaviorism may be seen as mutually complimentary, each capable of enhancing the other.

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Half a Loaf?

By Michael Yocum (437 W. 2nd St., Lexington, KY 40508.) Copyright 1987 by Michael Yocum.

When I came across William Powers' *Behavior: The Control of Perception* in 1978 or 1979 I was delighted. I am a psychotherapist and there is so much short-sighted, simple-minded nonsense written about human beings, both inside and outside of my profession, that it was a relief to discover someone looking at human behavior with a vision both fresh and precise. Until Powers' work I had pretty much relied on European phenomenology for a reasonably clear, consistent, and rigorous discussion of people as actively responsible for creating their own experience. The point is always important in treating human suffering; and there are times when realizing one's part in creating one's experience can make the difference between sanity and madness, or even life and death. As *William* Blake wrote in *Jerusalem* (Chapter 2):

> If Perceptive Organs vary, Objects of Perception
>   seem to vary:
> [... and...] What seems to Be, Is, To those to
>   whom
> It seems to Be, & is productive of the most
>   dreadful
> Consequences to those to whom it seems to Be,
>   even of
> Torments, Despair, Eternal Death....

But most people no longer take poetry seriously; and many who dip into phenomenology complain that it is too obscure and difficult, or just vague philosophizing and therefore useless. We live in a materialistic age, a time when deep respect is given to science and technology because they have become the most productive tools of materialism. People these days want quick, quantifiable results, and scientific techniques often yield them. So it was heartening to find that Powers, with admirable clarity and economy, had not only outlined our role in creating our experience, but had done so in a mechanistic form more likely to be understood and accepted by my clinical colleagues than the arcane musings of Blake or the tedious convolutions of Husserl. Powers' contribution was an excellent opportunity for science to join poetry and philosophy in balancing the one-sided perspective of behaviorism. I welcomed it.

Why, then, did I find the last issue of *Continuing the Conversation* so lifeless? And why does everything I have seen about "Control Systems Theory," in CC and elsewhere, so quickly bore me? Why does it seem so ugly? And why does that matter?

It appears that in correcting for the partial blindness of behaviorism, Powers, along with the radical constructivists and many of the champions of autopoiesis, may have made the same mistake as the behaviorists, concentrating upon only part of the total circuit. While it is essential to draw our attention to the human half of the loop, it is an error to emphasize one half while neglecting the other. The point, surely, is that the basic unit of action and decision is a completed circuit, a closed organization of transforms of differences in which both "organism" and "environment" are equally necessary. To exclude any aspect of the total circuit is to fail in providing an adequate description and explanation of activity in that circuit.

It may be merely injudicious phrasing on his part, but in the last issue of CC Powers seemed to be saying that our behavior controls our perception *without adding that our perception also controls our behavior*. In cybernetic description and explanation the relevant differences must take the form of a recursive network of mutual interaction. To single out only a part (or parts) of the circuit is to sever the pattern that connects, transforming a dance of health and beauty into an ugly and pathological sequence of linear manipulation. All around the circle the degree of control is partial and ultimately reciprocal.

And "influence" may be a better word than "control" to describe the phenomena in question, although I can't imagine anyone in our culture feeling comfortable subscribing to "Influence Systems Theory." To contemporary ears it sounds a little ridiculous. We are so influenced by the current epistemology that, whether we want to or not, we tend to believe in and value "power" and "control." The words are comforting, they make us feel more important and less ineffectual than we usually are. They are barely disguised cries of impotence. We might be better off if Wiener had chosen another word. "Control" carries a connotation of transcendent, one-sided manipulation which is simply inappropriate for describing activity in any part of a closed circuit of interactions. You might get away with saying that the circuit controls itself, but even then the structure of the circuit will be constrained ("influenced" but not "controlled") by the physical characteristics of the matrix or media in which it is immanent.

It would be understandable if Powers and the others have overcorrected. By the time cybernetic insights reach the level of practical embodiment in human activity they usually have been corrupted into a simple-minded, chopped-up mess of "inputs" and "outputs" aimed at unilaterally controlling specific behaviors of individuals or small groups. This mush, in which "systems" and related terms cover a morass of sloppy thinking and clumsy, ill-guided intervention, is enough to inspire everything from mild distaste to blind rage in anyone who cares about either human beings or cybernetics.

But it won't do to respond to this idiocy with the same narrow vision. In a purely materialistic world, half a loaf may be better than none—it will enable you to survive for a little while longer. But in a world of ideas—of the origin and propagation of information through organization of differences into recursive form—half a loop is lethal. And ugly. And boring.

Which brings me to my last complaint. CST appears to have rigor, but where is the imagination? I know from my own frequently unsuccessful attempts how difficult it is to achieve this combination. Yet that doesn't stop me from bitching about its absence in my own work or that of others. Powers laments that nothing of interest seems to be happening in cybernetics these days except for semi-technical reviews of earlier work. But the men and ideas he mentions combined both rigor and imagination, just as much of his own work has done. And we will always need both. Only the reciprocal interplay between the two is alive. Only that is of lasting interest, because only that can survive. With rigor alone, CST will remain aesthetically impotent—lifeless and boring—especially to those who remain unfamiliar with it and could most benefit from its insights. The task, like the knowledge to be conveyed, is at least twofold: we must not only state what is true but do so by presenting, as Hegel put it, "the True in the form of the True."

Finally, although there have been any number of things in previous issues of *Continuing the Conversation* with which I have disagreed, I have not written in before. The issues did not warrant the time and trouble. I am writing now because I believe that Powers' work is important. It is worth fighting about.

Some Thoughts on the Occult and the Supernatural in Cybernetics, Behaviorism, and Cognitive Science

By W. Tom Bourbon (Dept. of Psychology, Stephen F. Austin State University, Nacogdoches, TX 75962). Copyright 1987 by W. Tom Bourbon.

Introduction

Cybernetics, behaviorism, and cognitive psychology share an interesting attribute. Even though behavior is the action of a physical system, most advocates of those sciences do not suggest a physical *mechanism* which might produce behavior. The non-mechanistic explanations they do offer are not in the domain of natural forces or processes. Such aphysical explanations are *supernatural* and *occult*.

Engineers and physical scientists try to avoid occult ideas by modeling their assumptions about causal influences. In contrast, most adherents of cybernetics, behaviorism, and cognitive science reject attempts to model the causes of behavior. For example, to explain the conversion of cognitive processes into behavior, cognitive scientists usually defer to the neurosciences, where the preferred "model" is a top-down transmission of "commands" from brain centers to muscles. The commands are said to produce specific, predetermined actions. There is no good evidence that living things work that way, and much evidence that they do not.

Cognitive science never had its own model for behavior, but radical behaviorism and cybernetics each began with forceful declarations of models: in behaviorism, the S-R "reflex arc," described by Descartes and adopted by Ivan Pavlov and John Watson; in cybernetics, the "negative feedback loop," described by Norbert Wiener. Important as they were, both models embodied major weaknesses, most serious of which was their reliance on concepts of lineal causality. Lineal models are adequate in the physics of Galileo and Newton, but not in descriptions of living creatures.

The models of Pavlov and Watson and of Wiener are of the class now called input-output models. They were properly rejected by many theoreticians in their respective fields. But, in both fields, *the baby went out with the bath:* most attempts to identify physical causes were abandoned, and modeling was construed as inferior to other pursuits. In behaviorism, the preferred option is an often indiscriminate accumulation of experimental data. Behavior is anything one defines it to be; it "eventuates from," or is "occasioned by," the environment; and it is "controlled by its consequences." Behaviorists posit no physical models for "eventuating" or "occasioning," nor do they explain how any particular one of the many consequences of behavior comes to "take charge." And in cybernetics, the preferred alternative to examining and modeling behavior seems to be a relatively undisciplined discussion of abstractions such as "requisite variety," "information processing," and "infinite recursion."

Control systems theory (CST) affords an alternative to these approaches. The following is not a detailed exposition of CST. Rather, I will use my interpretation of the principles of CST to describe the causal relationships among my nervous system, my perceptions, my behavior, and my environment.

Behavior as a Control Systems Theorist Views It

What is my behavior? From the outside, you would perceive it as my maintaining and changing the positions of different parts of my body, relative to one another, or relative to objects in my environment. But there is more to my behavior than immediately meets your eyes. On the inside, it is the positioning of different parts of my skeleton, with muscles, skin, clothing, and all the rest going along for the ride. The configuration of my skeleton is manipulated by my skeletal muscles, which are themselves affected by motor neurons emerging from my central nervous system (CNS). My motor neurons are the classical "final common pathway" on which all of the other influences in my nervous system converge. The "pattern" of all those influences determines the activity of my motor neurons, and hence, of my muscles.

Two major influences converge on my motor neurons: a relatively small set of neurons originating in my sensory receptors, and a much larger set, originating inside my CNS, where every region contacts every other region via hierarchical loops of pathways. My receptors are the only places where light, sound, and other forms of "stimulus energy" from "the world outside" can affect my CNS (and hence, my muscles and my behavior), but those effects are far from direct. The numerous influences from inside my CNS relegate those from outside to a role vastly different from that of unilateral control over my behavior. What is often identified as a "stimulus" is merely a pattern of matter and energy in the world outside my nervous system, which disturbs my receptors. The world outside my CNS plays no other part in the affairs of my CNS or my behavior. Most popular usages of "stimulus" are occult.

In the view of CST, my behavior influences, but does not control, my environment; and my environment influences, but does not control, my behavior. The object of control is the *relationship* between my present perceptions of the world and my goals (the perceptions I *must* experience, or the ones I *expect* or *prefer* to experience). With my behavior, I create, maintain, or eliminate specific perceptions. My behavior varies, in any ways that are necessary and possible, to counteract influences which disturb variables in the external world that are related to my perceptions. In the model presented by CST, no part of the causal loop may be left out: if the typical physical structure or force represented by a portion of the loop is missing, either it must be replaced by a functional equivalent, or the loop, and the control it maintains, vanish.

My behavior is the only way my CNS influences the world outside of itself. My sensory receptors are the only means, short of violent intervention, through which the world outside of my CNS influences my CNS. In both cases, I rule out alleged parapsychological influences, for want of reliable supporting evidence.

Elaborations and Consequences

1. There is no "proper" place to begin describing the loop of influence, or control. All parts of the loop function simultaneously. To designate one part "the place to begin" is to state a preference, nothing more. (Contemporary behaviorists demonstrate such a preference when they say that every analysis of behavior must progress to an identification of environmental causes, then must stop.) In an analysis of behavior, neglecting one part of the loop leaves a gap, bridged only by unanalyzed influences best characterized as occult or supernatural.

2. The loop functions continuously, but does not embody "infinite recursion," which can occur in mathematics and formal logic, but not in a biological system. (I believe that many references to infinite recursion are mistaken attempts to describe the life-long circularity of causes in living systems.) The loop functions in "real time," as "defined" by the system itself. No significant problem goes unsolved for infinite time. A problem is brought to a satisfactory resolution, which probably is not formally optimal; or it is dropped, in favor of more pressing activities; or the animal dies, because time ran out. Formal logic may have time for infinite recursion, but the processes of life do not.

3. All that one element in the loop may do is disturb another element. The subsequent change, if any, is determined by the element to which the influence is applied, not by the source of the influence. This circumstance is like any other physical interaction, for example, my pressing a button, with consequences depending on the properties of the device of which the button is a part, not on any property of me or my behavior.

4. As it is popularly construed in cybernetics and information theory, "information" does not exist in the loop described above. Rather, "information" is an overused and poorly specified synonym for terms such as "stimulus," "energy," "pattern," and "neural activity." Most often, "information" is used in an occult manner.

5. CST does not support the popular idea that I independently control my environment, or that any "part" of me (e.g., a thought, the motor cortex, or a neurotransmitter pathway) unilaterally controls any other part (e.g., another thought or another brain area); neither does it support the idea that stimuli from the world outside of me control my behavior.

6. When I act to perceive things as I intend them to be, I do not "cognitively employ" a formal model as complex as what I intend to perceive, or as complex as the actions and influences which eventually produce those perceptions. To produce these pages in a comfortable setting, I do not "use" complex cognitive models of my computer, its software, the English language, and electricity. Nor do I use a model of my air conditioning system, the local power grid, atmospheric dynamics, and weather systems. My parts and "I" are functionally ignorant of how my fingers move over the keyboard, of how the letters appear on the screen, and of how the temperature stays just right. As a control system, all I need to know is that I want certain perceptions and that if I move my fingers to press now on this, now on that, different things happen. While writing about formal models of behavior, I use my behavior, but I do not use formal models. So much for the "requisite variety" of information-theoretic cybernetics.

Conclusions

Why do I say, with some seriousness, that cybernetics, behaviorism, and cognitive psychology are occult sciences? Because I believe they ignore readily observable interactions between physical creatures and their environments. Behaviorists say they do so because of their pragmatic goals of predicting and controlling behavior. Demonstrably, behaviorism *sometimes* produces knowledge adequate for those who wish to use the behavior of others, much as I use my computer or a hammer. To be an effective user may be a viable goal, but science is about more than that.

Other scientists ignore behavior because their primary goal is to develop abstract ideas, such as "cognition" or "information processing." Their efforts often yield mathematical proofs, but there is usually no account of the mundane (i.e., worldly, physical) details of behavior. In cybernetics and cognitive science, the popular notion of circular causality, incorporating infinite recursion, springs from these activities.

In contrast to behaviorism, cognitive science, and "mainstream" cybernetics, control systems theory rigorously models mundane features of animals and their behavior. Such modeling allows us to explicitly state, and to rigorously test, our occult beliefs—those points where scientific constructs fail and we appeal to our guesses about what lies beyond, and about how those unseen regions manifest themselves in this realm. If asked to define science, I would characterize it as precisely that process: the construction of accounts of how and why things appear as they do in this life—but the accounts must meet the test of pragmatic application and must include as much as possible of what is originally observed. The means by which control systems theorists attempt to do these things are presented elsewhere. The adequacy of their attempt is for you to decide.

The Dream of Reality: A Review

By Eric G. Carbone (P.O. Box 2023, Athens, GA 30612). Copyright 1987 by Eric G. Carbone.

"The Quality which creates the world emerges as a *relationship* between man and his experience. He is a *participant* in the creation of all things." Robert Pirsig, *Zen and the Art of Motorcycle Maintenance.*

Lynn Segal's *The Dream of Reality* (Norton, New York, 1986) is an attempt to lucidly present the work of Heinz von Foerster, a scholar whose areas of study include cybernetics, mathematics, philosophy, and physics. Segal's task is difficult, considering von Foerster's long and productive career and the technical nature of much of the material, but he does a commendable job. He manages to keep the length of the book short, and he avoids dry, overly technical writing that would severely limit its audience.

The aim of the book is not to summarize all of von Foerster's work, but to show how it supports his constructivist viewpoint. Indeed, constructivism is really the central theme of the book, and von Foerster's ideas about it, presented in the form of quotations and paraphrases of his lectures, are supported by references to other constructivists, including Piaget, von Glasersfeld, Maturana, McCulloch, and several more.

Before discussing constructivism, Segal summarizes the traditional realist view: "The dreams of reason denote a common denominator running through our language and logic, manifest as a wish for what we call 'reality' to have a certain shape and form." (Page 3.) This wish, he explains, is manifold: we wish reality to exist independently of us, the observers; we wish it to be discoverable, to be predictable and controllable, and we wish to confirm the truthfulness of our findings (cf.page 3). It seems hardly arguable that most of us think along these lines, and that many of us will refuse to consider any alternative philosophy.

An alternative philosophy is radical constructivism, which argues, as its name implies, that we construct our "reality"—we do not discover and explore it as passive, detached observers. The constructivism of von Foerster and others, as interpreted by Segal, claims that there are no observations independent of observers, as the realists argue. Segal puts it nicely when he states: "The logic of the world is the logic of the description of the world." (Page 4.)

Since the observer and the observed cannot be separated in the traditional way, it follows that constructivists consider understanding ourselves to be vital to understanding "reality." This leads constructivists to be very interested in recursion and paradox. Segal notes that recursion and the level-mixing involved with self-referential paradox are important in the understanding of cognition (cf. page 49). This has been the subject of a good deal of von Foerster's work.

The Dream of Reality presents constructivism by examining von Foerster's ideas on several topics. First, the notion of "objectivity" is discussed, focusing on its fallacy. Then language and its relationship to thought and reality is examined. This is summed up by a presentation of Maturana's ideas about language.

The second half of the book deals with the nervous system, including very brief outlines of neural function, computation, and bio-computation. The appendix consists of an interesting interview with von Foerster. The prime goal is not to be comprehensive in any of the areas examined—this would be unrealistic—but to show the relationships between these areas and the theory of knowledge which is being supported. The interview, incidentally, seems to have been included mainly for general interest, but it does bring out some points relevant to the subject matter.

The book reads easily in most places, but it has bitten off more than it can chew. Some of the more confusing areas, particularly those pertaining to neuronal networks and recursive function theory, are treated much too briefly. Of course, this is almost a necessity if the book is to remain of reasonable length and not get too technical. Still, some of these topics could have been explained a bit more clearly.

Segal does succeed in his aim of conveying not just the work, but the man as well. This may or may not be a plus for the book, depending upon whether or not the reader agrees with von Foerster's opinions, but in any case the anecdotes are often helpful and provoking. An example of this is von Foerster's discussion of the poor wording of the book of Genesis, with his suggested

revision, "And God was floating over the waters and He said, 'Let there be vision,' and there was light!" (Page 33.)

Those who already embrace the constructivist view will find *The Dream of Reality* enjoyable; those who are undecided may find it convincing enough to make them take a constructivist stance. For those who simply cannot or will not accept constructivism (though it makes such perfect sense), insisting that they can know "ontological reality," the book may be threatening or irritating. In any of these cases, it is well worth reading.

Two Gregory Bateson Poems

By Stephen Nachmanovitch (544 Venice Blvd., #2, Venice, CA 90291). Copyright 1987 by Stephen Nachmanovitch.

I wrote the first in 1972 and the second in 1980, just after Gregory's death.

Gregory Bateson

There's old Bateson,
A white growling mountain.
He'll let you peep at distant shores far within him.
He warms time.
His great Buddha-belly laughs at his nose.
He warms time.

Sink if you must below that illimitable blackness,
under that amazing horizon,
glinting edge of spirit world;
I know where you're going,
just exactly where and where you're floating down to;
and I will remember every thing,
every last word you taught me,
whooses of wind in night,
grains of sand, minute particulars of creation,
never to be repeated everliving wash of changing shapes,
insides of the whole earthly universe,
those colored stars,
those incessant ripples of her oceans' music,
those spawning places of whales,
that fruit of time hanging there in the sky,
momentary magic—one more winter gone—

and I know you are there,
as I circle round your dark side
and you round mine;
and I know you are there,
deep spirit;
and I know you will be back,
ancient, ancient light;
and I know you.

"Bateson" Stars?

CC subscriber—and former student of Gregory Bateson at U.C. Santa Cruz—Mackenzie Yearsley has proposed that a star or stars be named in honor of Gregory Bateson and his personal ecology. The International Star Registry, of Northfield, Illinois, and Geneva, Switzerland, facilitates star naming with official registration at the U.S. Copyright Office. Donations to such a project in excess of that needed for registration and for providing certificates of naming to members of the Bateson family could be used to support Bateson-related scholarly activities (for example, bibliographic work).

What do other Bateson appreciators think about Mackenzie's idea? What are appropriate names for "Bateson" stars? (The I.S.R. accepts names for individual and binary stars.) Are there other alternatives for the participatory honoring of Bateson by those whose lives he has touched? Write to Mackenzie Yearsley, P.O. Box 1272, Santa Cruz, CA 95061.

"The New Clarity" Conference-Workshop

Dr. Mary Catherine Bateson will give a lecture titled "Steps to an Ecology of Love" on Friday, April 24, 1987, at 8 PM at Teachers College, Columbia University. She will discuss *Angels Fear: Towards an Epistemology of the Sacred*, which she wrote for her father, Gregory Bateson, after his death. (This book is scheduled for publication in March 1987, and will be on sale at the lecture.) On Saturday, April 25, 1987, from 9 AM to 4:30 PM, Dr. Bateson will participate in a conference-workshop exploring "The New Clarity" via small-group and plenary sessions focusing on participants' interests in issues related to the individual (the "new" self; research directions; consciousness and clarity), the group (family, school, and human services; equity and cooperation), and society and the planet (aesthetics and the Sacred).

Enrollment in the conference-workshop is limited, and early registration and payment are advised. Participation can be on a non-credit basis or for one graduate academic credit. The tuition for credit is $310.00; the non-credit fee is $60.00. Attendance at the Friday evening lecture only is $20.00. If you want to enroll for credit, and you have not previously been admitted to Teachers College, you must pay an additional $25.00 admission fee, and submit proof of a bachelor's degree. Admission forms will be sent to you. If you are currently enrolled as a student at Teachers College, add the conference-workshop to your program of study at the Registrar's Office. Students registering for credit will be expected to:
1. Pick up (or request by phone or mail) a list of readings which will be prerequisite.
2. Meet once, as a class, before the conference workshop.
3. Prepare a brief paper as assigned/described at the class meeting.
4. Meet once again, for discussion, after the papers have been handed in.

Tuition (and, if applicable, admission fee) or non-credit fee are payable upon registering. Send to: Office of Continuing Education, Box 132, Teachers College, Columbia University, New York, NY 10027. Checks should be made payable to Teachers College. The College reserves the right to cancel the offering if enrollment is insufficient; in the event of cancellation, all tuition and fees will be refunded. For additional information, call the Office of Continuing Education, Teachers College, Monday through Friday, 9 AM to 5 PM, at (212)678-3065.

Dr. Paul Byers, of the Department of Family and Community Education, Teachers College, writes: "If there are a few people who would like to come but are discouraged by the cost of lodging, I'm sure I can find a place for them to stay for a night (or two) without charge, if they drop me a note in advance." His address is: Box 115, Teachers College, Columbia University, New York, NY 10027.

CST Videotapes and Workshop

The Control System Group (10209 N. 56th St., Scottsdale, AZ 85253) has announced availability of four half-hour VHS cassette tapes featuring William T. Powers, author of *Behavior: The Control of Perception.* The videotape series is titled "Control Theory: A New Look at Human Behavior," and it provides an introduction to the ideas of control systems theory (CST), including several demonstrations. To order, or for additional information, write to the Control System Group at the address given above. Price of the four-tape series is $145.00, postpaid. Make checks payable to Control System Group; purchase orders are acceptable.

On Saturday, May 2, 1987, Powers will conduct a workshop on CST at the Safari Hotel, 4611 N. Scottsdale Rd., Scottsdale, Arizona, from 9 AM to 4 PM. Cost is $25.00 with advanced reservations (no refund after April 29), $30.00 at the door. To register or obtain more information, contact Edward E. Ford, M.S.W., 10209 N. 56th St., Scottsdale, AZ 85253; phone (602)991-4860. Make checks payable to Control System Group.

asc news

Fundraising

Stuart Umpleby, Professor of Management Science at George Washington University, Washington, D.C., and former President of the American Society for Cybernetics, has apparently been busy fundraising. He recently acquired a donation of $50,000 to endow a "Cybernetics Research Program" at the University. A committee with members from the Departments of Philosophy, Electrical Engineering, Physiology, and Management Science (and possibly Psychology and Anthropology in the future) will decide on the distribution of annual income from the donation. Activities supported could include doctoral dissertation research, small conferences, and guest lectures.

Quoted in George Washington University's *Luther Rice Society Newsletter,* Umpleby says, "This area of study is ripe for major advancements; the field has already made important contributions to the philosophy of science, particularly epistemology... I believe the University is getting in on the ground floor, and with further support, we'll make this new program a great success."

Stu has also acquired for the American Society of Cybernetics two donations worth almost $35,000. These will be used for supporting activities of the Society such as the journal/magazine, special conferences, and scholarships.

Jobs

Systems Science Graduate Program Chair, College of Urban and Public Affairs, University of Louisville, Louisville, KY 40292. Contact: Dr. James A. Van Fleet, (502)588-6482.

Assistant/Associate Professor of Management Science, School of Government and Business Administration, George Washington University, Washington, DC 20052. Contact: Dr. Erik K. Winslow.

Temporary/Possible Probationary Teaching Positions in Cybernetic Systems, Cybernetic Systems Program, One Washington Square, San Jose State University, San Jose, CA 95192-0113. Contact: Dr. William K. Reckmeyer, (408)277-3410. The SJSU Cybernetic Systems Program was founded in 1967, and offers an undergraduate Minor Program and a Master of Science Degree Program. Courses emphasizing theory and practice in systems science/cybernetics are offered, with specialization in the following areas: systems tools (modeling, group methods, research techniques, graphics); informatics (general computing, simulation, knowledge systems); technology and society (historical dynamics, ethics, public policy); future studies (emerging trends, impact assessment, global affairs); and management (organizations, project management, office automation).

Faculty Positions in Engineering Management, Old Dominion University, Norfolk, VA 23508. Contact: Dr. Laurence D. Richards, (804)440-3758.

Director, Engineering Management Graduate Program, School of Engineering and Applied Science, Portland State University, Portland, OR 97207. Contact: Dean H. Erzurumlu, (503)229-4631.

Conferences

April 21-23, 1987: "Problems of (Im)possible Worlds," Amsterdam, THE NETHERLANDS. Information: Prof. dr. G. de Zeeuw, c/o Subfaculty for Andragology, Grote Bickersstraat 72, 1013 KS Amsterdam, THE NETHERLANDS. From the Conference announcement:

"It is proposed to discuss 'impossible worlds,' their generation by and for actors and the choice of preferable actions in them... Actors are allowed to act in and in relation to many different worlds. In some such worlds, to find or identify preferable actions, actors have to rely on criteria like taste, artistic feeling, a sensitivity for creative accomplishments, unexpectedness, openness, acceptance of uncertainty, the solvability of problems that cannot be but ill-defined in such worlds. Such creativity-inducing worlds are called here 'impossible worlds,' for two reasons. First, characteristically what is possible or preferable inside any particular world is impossible and unacceptable in terms of the selection or creation of such worlds. Second, the polarity is highlighted with the more mundane and well-known 'possible worlds' in which well defined criteria to judge 'good' actions are assumed available, non-conflicting over inside and outside.

"Possible worlds presently are the mainstay of scientific endeavor: worlds that can be seen as descriptions of or as selected parts of reality, which challenge to have their conditions or parameters for existence made more precise, and are hypostatic; and also worlds such as problem spaces, production systems, formal systems. In fact, knowledge of such possible worlds is immensely valuable; it increases control over actions as they meet the conditions and definitions of these worlds, and this kind of knowledge therefore provides especially strong support for implementing 'good' actions, as defined by the criteria of possible worlds.

"Fortunately or unfortunately, to solve problems sometimes the existence itself of such worlds must be put at stake. That is, it may be the ability to actually jump out of them which makes for better actions; the ability to create variety which is unexpected in such worlds. Worlds which stimulate actors to attempt such jumps indeed are impossible worlds: their very existence suggests their non-existence. The ability to deal with them will allow actors to act 'better' via the impossible, when not well via the possible. Such worlds teach how to straddle levels, without flattening them to sameness."

May 20-22, 1987: International Society for General Systems Research Canadian Division and Northeast U.S. Region Meeting, "Foundations of General System Science and Applications to Education," Ryerson Polytechnical Institute, Toronto, Ontario, CANADA. Information: Ken Burkhardt, (416)979-5000 ext. 6976, or Richard Jung, (403)432-8330.

May 23, 1987: International Symposium on "Self-Steering and Cognition in Complex Systems: Toward a New Cybernetics," Transdisciplinary Group of the Free University of Brussels. Information: Eric Rosseel, Center for Organizational Psychology, Pleinlaan, 2(3B233), B-1050 Brussels, BELGIUM.

June 1-5, 1987: International Society for General Systems Research Meeting, Budapest, HUNGARY. Information: Dr. Istvan Kiss, Bureau for Systems Analysis, P.O. Box 565, Budapest, HUNGARY H-1374.

June 21-24, 1987: Annual Meeting of the American Society for Engineering Education, Reno, Nevada. Bill Reckmeyer, David Mitchell, Gary Boyd, Larry Richards, Felix von Cube, Tom Plough, Boris Mikolji, and Dean Harper will be participating in a symposium on "Educational Cybernetics in Engineering."

July 13-17, 1987: American Association for Artificial Intelligence, Seattle, Washington. Information: (415)328-3123.

July 31-August 2, 1987: Eighth Annual Mental Research Institute Conference, "Solutions – Pseudosolutions – Ultrasolutions (Varieties of Change and of Being Changed," San Francisco. Information: Phyllis Erwin, Mental Research Institute, 555 Middlefield

Rd., Palo Alto, CA 94301. Faculty members include Frijof Capra, Mony Elkaim, Richard Fisch, Heinz von Foerster, Ernst von Glasersfeld, Peggy Papp, Madeleine Richeport, Virginia Satir, Peter Sifneos, Paul Watzlawick, and John Weakland.

September 7-11, 1987: International Congress of Cybernetics and Systems, London, ENGLAND. Information: Prof. J. Rose, 5 Margate Rd., Lytham St. Annes, Lancastershire FY8 3EG, ENGLAND.

September 23-27, 1987: Control System Group Annual Meeting, Kenosha, Wisconsin. Information: Mary Powers, 1138 Whitfield Rd., Northbrook, IL 60062.

December 2-6, 1987: Annual Meeting of the American Society for Cybernetics, "Creative Cybernetics: Our Utopianists' Audacious Constructions," Urbana, Illinois. More details later.

Journals

All 1987 members of the American Society of Cybernetics are eligible to subscribe to three journals at substantially reduced rates: *Cybernetics and Systems* (bimonthly), $35 per year; *Systems Research* (quarterly), $16 per year; and *Kybernetes* (quarterly), $35 per year.

Send orders to Larry Richards, Department of Engineering Management, Old Dominion University, Norfolk, VA 23508. Checks should be made payable to the American Society for Cybernetics.

Addresses Sought

For the following individuals, the addresses on the ASC mailing list are apparently out of date. If you know any of the current addresses, please contact Larry Richards, Department of Engineering Management, Old Dominion University, Norfolk, VA 23508, phone (804)440-3758.

Philip Dechtenberg, Joseph Edozien, Fernando Flores, Kerry Heffner, Glenn Hunt, Georges Khal, Vadim Kvitash, Claude Lebon, Samuel Magrill, Michael Pincus, R. Lea Singer, Mike Wenger, Paul Westin, Christopher Wrather.

If you move and you want your ASC mail to reach you, please report your new address.

1987 Asc Dues Overdue

If you haven't yet sent in your 1987 American Society for Cybernetics membership dues, please do so immediately to avoid missing future issues of *Continuing the Conversation.* Regular dues are $50.00; dues for full-time students are $30.00. Send to Larry Richards, Dept. of Engineering Mgmt., Old Dominion University, Norfolk, VA 23508.

Erratum

The graph illustrating the Giffen Effect in "Control Theory and the Smithian Economics," by Bill Williams *(Continuing the Conversation* Number 7, Winter 1986) was reproduced *incorrectly.* The corrected graph is shown below. Note that for a fixed total budget and caloric requirement, an *increased* bread price (with fixed meat price) results in the purchase of more bread.

CC Subscriptions and Back Issues

Subscriptions to *Continuing the Conversation* are $4.00 per year ($6.00 per year outside North America; U.S. funds only). Back issues are available for $1.00 each ($1.50 each outside North America; U.S. funds only). Order from: HortIdeas, Rt. 1, Box 302, Gravel Switch, KY 40328. Make checks payable to "HortIdeas."

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Continuing the Conversation

A Newsletter of Ideas in Cybernetics

From the Editor

This issue of *Continuing the Conversation* is again dominated by considerations of Control Systems Theory (a.k.a. Control System Theory and Control Theory, with or without capitalization). Readers who are specifically interested in these issues might want to step back and consider how this particular "continuing conversation" reflects the history and current state of cybernetics (see the article in this issue by Larry Richards for more thoughts along these lines). And those who are tired of CST-talk should be aware that its abundance here reflects default at least as much as design—over the past six months, several people have sent papers on CST, but few have sent papers on other topics in cybernetics. I want to make it explicit: this newsletter should be a forum for discussion of all significant cybernetic ideas. Surely CST isn't "all that's happening" in cybernetics! Or is it? Write and let all of us know about what seems important, profound, ridiculous, abhorrent, or obscure to you. Deadline for the next issue is September 1st.

Is Control Theory Just Another Point of View?

By William T. Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1987 by William T. Powers.

Hello Pitman, Yocum, Bourbon, et you-al.

Roger P., I know that you would be right if we were talking about any other subject in the soft sciences. But if you think control theory is just another "legitimate approach," that it differs only in "emphasis and semantics" from older approaches, that the "apparent contradictions are... illusory," and that it's mainly a matter of understanding the other side's language—well, I've failed to communicate. I'm a little suspicious that you're being sly, considering your beautiful new paper on control theory and psychopathology (Pitman, 1987). But taking your comments at face value, let's look closer. Just to be more even-handed, open-minded, and respectful of alternate interpretations (it's a free country, isn't it?), let's compare the control-theoretic model and the behavioristic model in the context of reinforcement or reward.

First, what is the *appearance* that we're trying to explain? The appearance is that when certain happenings follow from the behavior of an organism, the behavior sometimes tends to continue or repeat. It seems as if certain consequences of behavior often affect the organism in a way that makes it produce more of those consequences. In some situations, such as a Skinner box in which there is only one simple action that will generate a reinforcer—commonly food—the organism reliably comes to produce that action. After a learning period, some average rate of behavior causes some average rate of reinforcement. When food-rewards are obtained at a level that could sustain life (enough to keep the rat near the bar instead of nosing about elsewhere), the observed relationship is that an *increase* of reward rate results in a *decrease* in behavior rate (Staddon, 1983, pp. 212-213). Skinner's early generalizations were drawn from data taken under highly abnormal, although standard, conditions. A rat would starve to death on the schedules he used.

According to my use of control theory, a reinforcer is some per-

ceived object, event, sensation, and so on (I think I have identified 10 hierarchical categories) for which an organism has an internal specification, a "reference signal." The organism, for internal reasons, wants to experience an amount A* of the perception A. It is the difference A* – A that is the immediate motivation for behavior. When control is successful, we find some continuing (and varying) behavior pattern that adds to variable external disturbances and constraints in just such a way to maintain A near the value A* (as *we the observers* perceive it). That relationship is called "control of A." If A* is set to zero, the behavior maintains the perception A at zero—e.g., the reference level for pain is almost always zero, leading to avoidance.

The rat in the Skinner box presses the bar at a rate that maintains the rate of food reinforcement as near as possible to the rate specified inside the rat as the desired or needed amount. Now if you add free ("non-contingent") food, the behavior rate drops; if you make the schedule yield less food, the behavior rate rises. Behavior changes to oppose disturbances. A force-fed rat stops pressing until its weight drops to normal.

There is no reinforcing value in the external counterpart of the controlled perception: perceptions only report the state of the (constructed, consensual) world: they cause no action. Their value is established by the inner reference signal. A appears to be positively reinforcing if and only if the organism wants and tries to get some non-zero amount A* of A.

OK, that's a brief control-theoretic explanation of reinforcement phenomena (plus a few little-known but quite reliable facts). Reinforcement works because the animal wants the apparent reinforcer and acts, or learns to act, to get it. That's a control system, and we can build or simulate a working model of it, if it's not too complex. The model reproduces all observed phenomena for single fixed-ratio schedules.

Now, what's the behavioristic model that explains the phenomena? The reinforcer follows the behavior, perhaps accidentally at first. Its effect on the organism is -what? This "what" is connected to something something something and finally to the muscles, presumably, which act on the limbs to produce forces that add to other variable forces and work through variable constraints to cause physical changes aimed with uncanny accuracy at just the consequence that will cause another reinforcement to occur. Of course you have to be careful to avoid "satiation" or it won't work at all. I think I had better leave that model to you, Roger, because I don't see how to make it work, especially not when the reinforcer affects a "probability of a response." I don't know how to model a probability. I don't think there really is a model.

The concepts of reward and punishment are very old. I think they represent a serious misinterpretation of human nature. I know how they are *supposed* to work (your example) and how people keep trying to *make* them work. They sometimes *seem* to work, if the person wants A and doesn't mind producing the actions needed to get A (that is, if the actions don't prevent accomplishing B, Z, which the person also values, wants, or needs). But human affairs have been conducted for a long time on the basis of the promise of reward and the threat of punishment, or in general the old causal interpretation of behavior. How are we doing? Our experiment with that model is advanced enough to allow drawing a conclusion: it's a failure.

Mary will reply for both of us to Yocum's fine remarks and occasional misconstructions.

References

Pitman, R.K., 1987, "A Cybernetic Model of Obsessive-Compulsive Psychopathology," *Comprehensive Psychiatry* , in press.

Staddon, J.E.R., 1983, *Adaptive Behavior and Learning,* Cam bridge University Press, Cambridge.

Who (or What) is in Control Here?

By Roger K. Pitman, M.D. (Veterans Administration Medical Center, 718 Smyth Rd., Manchester, NH 03104). This work was performed by an employee of the U.S. Government as part of his official duties and is therefore in the public do main.

Bill, it's not hard to see that your reference signal for behaviorism is set at zero. This may account for your not really having addressed the points I made in my friendly attempt to integrate behaviorism into control systems theory (CST). And that 3 AM denouncement of behaviorism in the April Control System Group *Newsletter*—my goodness!

I don't doubt for a minute that by clarifying the concept of purpose and its central role in behavior, CST has made a great leap forward, one that I enthusiastically endorse. However, to dispense with the concepts of reward and punishment is a sacrifice that I don't feel ready to make, especially when I believe that they can be profitably incorporated into CST. In fact, it seems to me that you have already gone a long way toward doing so in your book (Powers, 1973). I think you will agree that from a CST standpoint, the principles of behaviorism hold so long as reference signals remain constant, i.e., then (and only then) there exists a 1:1 relationship between perceptual input and behavioral output, between stimulus and response. Hence behaviorism constitutes a special case of CST, valid when the condition of fixed reference signals is met. Now let's consider your hypothesized reorganizing system. You yourself have said (ibid., p. 183) that its reference signals are "genetically given," i.e., they are fixed. It follows that a 1:1 relationship would be expected to exist between the reorganizing system's input and its output. The input to the reorganizing system, as you propose, is a set of intrinsic physiological quantities, while its outputs are changes in the hierarchy of behavioral control systems. The result of a reduction in intrinsic error, however achieved (whether through swallowing a gift of chocolate syrup proffered by a conniving parent, finding one's own chocolate syrup to swallow, or through the direct electrical or chemical stimulation of the median forebrain bundle) is to cause the perceptual signals that were active at the time preceding the reward to become reference signals for future perceptions. It is true that the organism continues to pursue its own goal of reducing intrinsic error; it will always do that. But the *manner* in which it does so has been changed. Reference signals for perceptions have been altered. As the behaviorists would say, behavior has been shaped. This is not a trivial point; sometimes the consequences of reinforcement can be profound. Witness the agoraphobic who may become totally housebound, sometimes for years, as the result of experiencing a few highly aversive panic attacks in public places. The consequences of reward can be profound, too. "How ya gonna keep 'em down on the farm after they've seen Paree?"

A couple of additional minor points in response to your comments, Bill. You chose appetitive conditioning to make the point that an increase in the reward rate results in a decrease in the behavior rate, an observation inconsistent with behaviorist theory. It seems trivial that when an animal's hunger is satiated, food is no longer rewarding. Also, if one chooses to consider aversive instead of appetitive conditioning, the point you raise isn't so

applicable. Along a different line, I would be less inclined than you to disparage scientific theories that model only the probability of events. This seems to be the best that quantum mechanics can do, and I don't think we would discount that branch of science. Indeed, some have suggested that the brain may operate according to quantum principles, and if this be the case, stating probabilities may be the best that can be done with regard to behavior as w ell.

It occurs to me that locus of control may influence one's choice of models of behavior. Those with an internal locus of control may favor your view that the organism learns to get the apparent reinforcer it wants, and those with an external locus may, along with the behaviorists, tend to see the organism as buffeted about by the twin fates of reward and punishment.

Finally, Bill, I will close by soliciting your opinion, from the CST standpoint, of the following anecdote. A wedding has just concluded, and the lucky husband and wife are mingling with friends and relatives at the reception. After a delicious meal, the wife announces to the company that she will now show them how the couple's future married life is to be conducted. She then takes out a piece of chalk, draws a circle on the floor, and asks her husband to step inside it. Having done this, she tells him in front of the assembled company that if he steps outside the circle before she gives permission, he can forget about their consummating their marriage for a month (punishing reinforcer). So there the husband stays for more than an hour, as the party goes on around him. Finally, one of his friends approaches and chides him for letting his wife push him around. "What do you mean, 'push me around'?" asks the husband. "While she hasn't been watching, I've stepped out of this circle three times already!"

Reference

Powers, W.T., 1973, *Behavior: The Control of Perception,* Aldine, Chicago.

"Half a Loaf?"?

By Mary Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1987 by Mary Powers.

> Safe upon the solid rock the ugly houses stand:
> Come and *see my* shining palace built upon the sand!
>
> Edna St. Vincent Millay

Michael Yocum ("Half a Loaf?" in CC Number 8) finds recent work in control theory lifeless, ugly, and boring. Too much rigor, and not enough imagination. He wants to see the shining palace; people in Control Theory are trying to make sure it is *not* built upon the sand. Hence the boring stuff: the bricklaying and plumbing and wiring. And it is tough to do: not only must the bricks be laid, they must be invented in the first place, and made. And the building inspectors (journal editors and reviewers) are tough: this palace looks mighty peculiar to them, and probably violates all the building codes. How's this for a turndown: your statistics are too good, you must have faked them. Or, your statistics are too good, that means the whole experiment is trivial.

Aesthetics reside in the eye of the beholder, and there are those who find beauty and excitement in a carefully designed experiment that nails down a phenomenon so thoroughly that one is accused of fakery. I should add, however, that control theorists are who they are, and do what they can with the imaginations they've got. Certainly the welcome mat is out for world-class, spark-generating imaginers (preferably with clout, tenure, and grantsmanship). One would hope, incidentally, that such paragons would not make the mistake of seeing symmetry in the effects of behavior on perception and the effects of perception on behavior. To quote W.T. Powers (in his first draft of "Is Control Theory Just Another Point of View?"):

Perception most definitely does not control behavior: just the opposite, when there is control. If a perception is disturbed, we alter our actions to restore it to the right condition. That's control. If a behavior is disturbed, does the (nonliving) world alter our perceptions to restore the behavior to its former state? No. Perceptions report the state of the (constructed, consensual) world, but don't tell us what to do about it. The inanimate world contains no natural control systems. That's why we call it "inanimate."

On to the subject of "control." This is a word guaranteed to make the hackles rise. Yocum immediately associates it with power and manipulation. How about guiding and regulating? Also legitimate definitions, though a bit further down the list. A reminder is in order that control theory was developed by engineers who needed to regulate machinery without some person having to stand around twiddling knobs all day. The devices they built and build have sensors and reference signals and comparators and effectuators, and fat, difficult books are published every year describing how to design them and build them and stabilize them. It was a giant leap of imagination for Wiener to realize that self-regulating devices behaved homeostatically, like the physiological mechanisms being studied by his buddies in Walter Cannon's lab, but everything (i.e., cybernetics) that followed from that does not negate a full-blown engineering specialty or call for a change of name. W.T. Powers first learned about control systems in Navy electronics school, and much of his professional career has been spent designing and building them. The theory (that is, the principles) involved in designing control hardware and software is *exactly* the same theory that informs his work with wetware, and control theory is what it happens to be called.

It seems to me that equating control and power is a semantic consequence of the First Industrial Revolution, as represented by machinery kept from galloping out of the building by being enormously heavy and bolted to the floor. Control of brute force by brute force. In the Second Industrial Revolution (which to my mind is not electronics, as some have said, or the invention of the transistor, as others have said, or even the computer, as lots of people have said—but control theory, which is what Wiener said, calling it automation and being more concerned with immediate social consequences than with conceptual ones) the idea of control is going to change. Control is a bad word now because it implies pushing things and people around. The things don't mind, the people do. Control theory explains why. When control theory is understood by enough people, the idea of trying to push people around will become ludicrous, not to mention poor taste. The meaning of the word will change along with the bad habit of treating living systems as inanimate objects, which became codified 400 years ago with the birth of "real" science, and culminated in the excesses of Behaviorism.

This comment has focused on some of the negative things Yocum had to say about control theory. I hope it serves to counter his disillusionment and refresh his delight.

Dear Michael Yocum

By Philip J. Runkel (Division of Educational Policy and Management, College of Education, University of Oregon, Eugene, OR 97403). Copyright 1987 by Philip J. Runkel.

Please look again at the book (Powers, 1973). Look at almost any of the diagrams. Again and again, those diagrams show the person (the neural net, the organism) on one side of a line and the environment on the other. If you were to cut the page in half at that dividing line, either actually or in your memory, then you would commit, as you said in CC Number 8, "an error to emphasize one half while neglecting the other." I can only plead with you not to cut the pages in half.

It is true that the chapters on the higher levels of the neural net spend most of their space on internal structure. Most of the chapters, however, deal repeatedly with both the person and the environment. That is especially evident in chapters 4, 5, 16, and 17. It is easy, I admit, when you have had your attention on one side of the line for many years, to be so impressed with what you discover on the other side that you forgot that the familiar side was also there.

You also say that not only does behavior control perception, but also perception controls behavior. Look again at the diagrams. All contain a closed loop (sometimes implicit) lying partly in the organism and partly in the environment. That means that causation in the loop is circular. Any feature of it controls a "later" feature, round and round, just as two o'clock comes before eight o'clock and eight o'clock comes before two o'clock. How could Powers *not* agree with your statement?

Look also at the experimentation, which of course *must* deal with environmental events. In addition to Powers' experiments, I admire especially those by Marken (1985, 1986). As to pieces in *Continuing the Conversation* -well, were all struggling.

References

R.S. Marken, 1985, "Selection of Consequences: Adaptive Behavior from Random Reinforcement," *Psychological Reports* 56, 379-383.

R.S. Marken, 1985, "Perceptual Organization of Behavior: A Hierarchical Control Model of Coordinated Action," *Journal of Experimental Psychology: Human Perception and Performance* 12, 267-276.

W.T. Powers, 1973, *Behavior: The Control of Perception,* Aldine, Chicago.

Reply to Philip Runkel

By Michael Yocum (437 W. 2nd St., Lexington, KY 40508). Copyright 1987 by Michael Yocum.

Dear Philip Runkel:

Thank you for responding, and thank you also for the Marken references. But I am a little confused by the first paragraph of your note. Firstly, I was not focusing upon Powers' work in *Behavior: The Control of Perception.* Rather, it was the ambiguity of his piece in CC which prompted me to write. And secondly, you say "Again and again, those diagrams show the person... on one side of a line and the environment on the other," thus clearly stating that Powers did indeed draw such a line, while at the same time asking me not to do so (or perhaps just not to take his very seriously?). I am not at all clear about what you mean. That aside, you address my concern about the presence of a distinction between "organism" and "environment" precisely. In what contexts is it appropriate to draw such a line, and in what contexts should it be abandoned in favor of other distinctions?

In general we seem to agree that the relevant chains of causation in our explanations must be circular, and that these explanatory links will pass through both those aspects of the universe we call "organism" and those we call "environment." My question is whether Powers assigns an inherently greater causal value to those links in the "organism" part of the circuit—as the behaviorists did to those in the "environment" part—or does he simply choose to concentrate his efforts on one aspect of the loop while fully understanding that the remainder of the circuit is equally important? Is it a matter of convenience in writing, which I can understand and accept; or does he actually believe that the line is hard and fast, and that the stuff on the "organism" side has a greater explanatory value?

Even though I took your advice and looked again at *Behavior: The Control of Perception,* I still haven't found a satisfactory answer to my question. On the one hand he says, "What an organism senses affects what it does, and what it does affects what it senses." (Page 41, emphasis his.) With that statement I agree wholeheartedly. The circuit is complete and Powers' emphasis draws attention to the part which the behaviorists neglected. And there are many such passages in the book. It really is a work that deserves to be more widely studied and no doubt would repay several readings. On the other hand, on page 271 he writes:

Control of behavior is not wrong or sinful or irrational or evil. It is simply inconsistent with the facts of human nature. If we become trapped into talking about control in terms of right and wrong, we will miss the essential point completely. We will start arguing over who will control the controllers, and so on, tacitly assuming that control is really possible in the first place. It is not possible. People cannot get inside each other's brains to operate the control systems there, and those control systems are what cause behavior. People can disturb each other's behavior, but unless they could actually feel the other person's intrinsic errors they could not be sure whether that person would cooperate or turn violent.

Here he locates his causal agent—a "control system"—inside the brain. Locating causal agents in various parts of the body is not a new human activity. Familiarity with even a little anthropology reveals that people have been doing this sort of thing for thousands of years. Ask a cannibal what part of the enemy's body is eaten and why, and, depending upon whom you ask, you will discover that the liver is the location of courage (or the soul); intelligence resides in the ears; perseverance is found in the skin of the forehead; strength in the testicles (or feet); and bravery, of course, is localized in the brain. *De gustibus non disputandum est.*

In our culture we have pretty much favored the head and the heart from the beginning. Empedocles believed that thought originated in the blood around the heart, Descartes argued that the soul was in the pineal, and so on and on, *ad nauseum,* for the last two and a half millennia. Although a currently fashionable theory relocates rational cognition in one side of the brain and intuitive forms of knowing in the other, most people in the civilized world today continue to associate intelligence with the human head, particularly the brain, while everyone knows that feelings reside in the heart.

The Zodiacal system, which performs this sort of apportioning systematically and also relates it to the cosmos, is one of the most enduring human frameworks for the explanation of events, having been around at least since the Sumerians, and probably much longer. As the recent revival of interest in astrology shows, the method is still popular. Use it and you may spend your entire life comfortably juggling bits and pieces of data within a framework which has stood the test of time and is shared and reinforced by many of your fellow citizens. If your predictions aren't quite up to snuff that does not mean your theory is wrong. You just didn't get the details quite right. Try again. And if your predictions are correct, well then surely your theory must be correct. (Various forms of pre-Copernican astronomy, fundamentally wrong in their assumptions about the nature and structure of the heavens, nevertheless allowed for the prediction of times and locations of astronomical events with an accuracy which, until quite recently, *exceeded* that of scientific methods. Empirical evidence *proves* nothing.) Over many centuries the names in the boxes have changed repeatedly, but the shapes of the boxes and their relationships to each other always remain the same.

To communicate with Mars, converse with spirits,
To report the behaviour of the sea monster,
Describe the horoscope, haruspicate or scry,
Observe the disease in signatures, evoke
Biography from wrinkles of the palm
And tragedy from fingers; release omens

By sortilege, or tea leaves, riddle the inevitable
With playing cards, fiddle with pentagrams
Or barbituric acids, or dissect
The recurrent image into pre-conscious terrors -
To explore the womb, or tomb, or dreams: all these are usual
Pastimes and drugs, and features of the press:
And always will be, some of them especially
When there is distress of nations and perplexity
Whether on the shores of Asia, or in the Edgeware Road.

T.S. Eliot
"The Dry Salvages"

Even though Powers' language is contemporary -"feedback," "output function," "reference signal," "neural current," "comparator," and so on—and his agent is recursively structured, he still slices the universe up by drawing lines *between* localized quasi-entities, rather than *around* circular patterns of relationship. Instead of "bravery" or a "demon" or "spirit" or "homunculus," we have a "control system."

To use a computational metaphor (of which Mary Powers seems quite fond—*wetware!?*), although the specific steps in addressing memory may vary with the language used and the instruction set of a particular central processing unit (CPU), the operating system remains the same. The basic dissection of memory—the allocation of blocks for code and data, the partitioning into various segments, the size of the segments, the kind and location of overhead sectors, etc., etc.—is predetermined at a higher level by the design of the operating system. And at higher levels still, there are the constraints imposed by digital versus analogic coding and serial versus parallel processing. What I am trying to say is that you don't really change things very much by substituting a "control system" in the brain for a "demon" or "spirit" in that or some other part of the body.

If we are going to think in terms of entities, then we need to focus upon the interface, the boundary, the relationship between them. This is difficult. And one of the major reasons for the difficulty is that relationship is not an "it." Such phenomena do not possess the attributes of concrete physical existence. Like ratios, for example, they do not exist except in the juxtaposition of what, given the limitations of the language in which I write, I shall call their "components." As Bateson said, "It takes two to know one." And as you say, "... causation in the loop is circular."

So where does Powers stand in all this? I don't know. What I have seen of his work is not sufficiently clear to me to permit an answer to that question. You ask, "How could Powers not agree with your statement?" As you can see, he does so in a peculiar sort of way, by having his wife do it for him (in her letter quoting the first draft of his piece). If he stands by that statement, why delete it from his final draft? If he does not stand by it, why include it in the first place?

Will the real William Powers please stand up?

In Lieu of a Reply to the Powerses

By Michael Yocum (437 W. 2nd St., Lexington, KY 40508). Copyright 1987 by Michael Yocum.

Dear Greg Williams:

Thanks for the invitation to respond, but I am not really sure how to reply to Mary or Bill Powers. I like much of Bill's work, and believe that it is some of the best being done today. Yet, as he repeatedly says in *Behavior: The Control of Perception,* there are several ways in which he may be wrong. In particular, I think that he is wrong in his choice of fundamental units. I believe that many important error-correcting circuits exist not only within organisms, but pass through them.

I don't mean to deny the truth or importance of the work of von Uexküll, the Gestalt psychologists, von Foerster, Maturana, Varela, Powers, von Glasersfeld, et al., in making the point that experience is active rather than passive, that it is something we create as much as something which merely happens to us. Gregory Bateson said again and again that his discovery that all he could ever know were his own perceptions was a moment of great understanding and liberation in his life. And Powers made the point in his original CC article that "it's all perception." This realization, stated by Husserl at the beginning of this century, is also the starting point for phenomenology.

Nor do I deny the importance of the difference between me and the rest of the universe. At times I have gone to great lengths to maintain that boundary. I assume that when I can no longer do so I will be dead. I am that boundary; or rather I am the continual process of creation of that boundary. To date I have seen no better definition of a living organism than the one proposed by the theory of autopoiesis:

> An autopoietic system is defined as a unity as a closed network of productions of the components that recursively, through their interactions, realizes the network that produces them and constitute its boundaries by realizing the surfaces of cleavage that separate it as a composite unity in the space in which they exist. (Maturana, 1981, p. 30)

* And yet, in order to maintain that boundary which is me, there must be ways of crossing it; that is, there must be an interface. Some of the molecules constituting tomatoes and cabbages must cross over to become molecules constituting me. And some of the ideas constituting my culture or civilization also will become ideas constituting me. And it certainly seems to be the case that some differences out there in the universe are transformed into differences in my neural circuitry, which in turn are transformed into differences in my muscles and the positions of my bones. Or, to put it in the terms of this discussion, some of my perceptions (e.g., of an approaching storm) must influence my behavior (heading for shelter), which then will influence my perceptions, and so on, round and round the circle. Indeed, I am trying to maintain a more or less constant reference signal by running for the house. But that is a meaningless statement without taking into account the greater (environmental) system of which I am a part. In order to maintain that unity which is me, I must participate in a larger unity which is not me (but which includes me). To insist upon either circuit as the only real or correct one is to risk the loss of both. Perhaps we could agree to talk about circuits within circuits.

Then there is the question of aesthetics. Mary Powers misses my point in exactly the same way that you did when I first mentioned my qualms about the lack of elegance in recent CST stuff. ("So you want it all prettied up, huh?") Unfortunately, I don't have the opportunity to spend a couple of hours discussing it with her as I did with you.

* And, of course, I disagree with her when she says that "Aesthetics reside in the eye of the beholder." That which we call "beauty" and "ugliness" arise from the relationship between the beholder and that which is beheld; and, further, that relationship has meaning (excluding "beauty" or "ugliness") only by virtue of existing in multiple contexts.

Speaking of contexts, it sounds as though Powers has had a tough time getting people to take his work seriously, and that both he and his wife now have all their defenses up. That is understandable. But it is a pity, and tends to lead to the simplicities typical of overly symmetrical relationships. The statements that "aesthetics reside in the eye of the beholder" and that we have "control systems" located in the brain seem to me too one-sided and simplistic. It is not so much that they are untrue, but that they reflect only partial or

* For errata regarding sentences, see CC number 10, page 15.

half truths at best. Both "the eye of the beholder" and "the control system" need "the object beheld" and "the environment" in order to exist as "eye" or "control system."

It's really a variation on the old nature/nurture, mind/body dichotomy. If you believe in that distinction, then your answer will have to fall on one side or the other. A "control system" located in the brain certainly answers the question. But the question itself is wrong. For most of his life, Bateson wrestled with this problem far more elegantly and cogently than I do here. Chapter XI of *Angels Fear* (Bateson and Bateson, 1987) addresses the issue one last time, and I would recommend it to the proponents of CST who want to locate control in some part of the systems they study.

Lastly, Powers and his wife seem to think that I misunderstand aspects of his work. That may well be. But I would argue, instead, that I simply disagree with some of his underlying premises.

I suspect that part of our disagreement and/or misunderstanding stems from the fact that Powers, so his wife says, has spent much of his professional life designing and building control hardware and software: machines and programs to run them. Such machines are always designed—they do not arise spontaneously—and they always have the designers' purposes built into them. That is precisely why and how they are constructed. The patterns of life, however, are not designed, and their "purposes" arise from the recursive nature of their organization in relation to other patterns and to the non-living universe, rather than from the relatively simple goals and aims of a designer.

You can tear a machine down into its smallest parts and reassemble it and it will run perfectly well, perhaps even better than before. But you can't do that to a tree or a flower or an animal. Machines are actually put together from parts while living systems grow as wholes in which parts come about only through some sort of destruction of the whole. You can see parts in a living system easily enough, but that does not mean that they are actually there. It's all right to see faces and castles and camels in the shapes of clouds as long as you remember that you are seeing them and that they are not in fact in the clouds. There is Powers' point again: "It's all perception." Nevertheless, you need the clouds (or rocks or trees—whatever you happen to see the patterns in). A clear blue sky will not do. His "it" which is "all perception" is human experience, not the universe which is transformed into human experience. (Does he know about logical types?)

Aesthetic knowledge arises with the comprehension of wholes rather than a dissection into parts. Perhaps the CST people should spend a little time walking in the woods, or poking their noses under rocks, in the hope of establishing an aesthetic relationship with the living world, thereby gaining a better understanding of the difference between living and non-living forms of organization.

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Some Heretical Thoughts about Control Theory

By Dr. Michael Hyland (Department of Psychology, Plymouth Polytechnic, Plymouth PL4 8AA, Devon, ENGLAND). Copyright 1987 by Michael Hyland.

I have worked with Bill Powers—though only by letter—and so I read CC Number 8 with considerable interest. Like others, I found Powers' *Behavior: The Control of Perception* (Powers, 1973) an inspiring book. I have also found Bill to be an excellent and non-dogmatic teacher, and I owe much of my understanding of control theory to him.

But I also agree with Michael Yocum that the account of control theory presented in an earlier CC was boring and lifeless; that concentration on "inputs" and "outputs" is lacking in imagination and, at worst, ugly. And I agree with Roger Pitman that the way control theory is presented at the moment may be creating an unnecessary schism in psychology.

I would like to present an approach to control theory which some people may find heretical. These sometimes heretical views can be expressed as a series of statements.

1. Control theory is not unique in suggesting that behavior is goal-oriented. There are several different theories of motivation which make a similar claim. The question of whether or not human behavior is purposeful was an issue 50 years ago when behaviorist accounts were competing with motivational accounts of behavior. For example, Lewin, Murray, and Tolman all base their somewhat different motivational accounts of behavior on the assumption that organisms are goal-oriented. Comparisons of control theory with radical behaviorism have little value, given the demise of behaviorism and the rise of cognitivism (whatever that means) in the early 1970s.

2. Most theories of motivation include some reference to negative feedback. Primitive notions of control theory are, in fact, implicit in theories of motivation (e.g., those of Lewin, Murray, and Tolman), and exemplified by references to homeostasis. That these homeostatic references are conceptually primitive should not blind us to the similarities between control theory and motivational theories.

3. Control theory is best introduced to psychologists not as a new theory, but as a new metatheory. A metatheory enables integration between apparently diverse theories by proposing a more general theoretical framework within which specific theories can be located (Hyland, in press – a). Control theory is at a more fundamental level than theories of motivation (Hyland, in press – b) in the same way that physics is at a more fundamental level than chemistry.

4. Control theory provides the form of a theory, not its content. Control theory leads us to ask sensible questions about behavior, but it does not provide us with the answers. For example, control theory tells us that there is something called a reference criterion, but it does not tell us how that reference criterion might be described. Incidentally, my own belief is that reference criteria high up in a control hierarchy should be described mentalistically, and specifically not as mechanistic "inputs" (see Hyland, 1985, for a comparison of mentalistic and mechanistic theoretical terms).

5. Control theory is a tool for producing theories, just as an artist's paintbrush is a tool for creating pictures. Powers (1984, p. 358) says "I am a tool-maker not a psychologist." To an admirer of fine paintings, paintbrushes may be uninteresting—though they will not be boring to manufacturers of paintbrushes. The problem with the current presentation of control theory is we have gotten preoccupied with the tool (the paintbrush) rather than the theories the tool can make (the paintings). Control theory will "come alive" when people start using it for specific theoretical and applied purposes. But perhaps we shouldn't expect the paintbrush manufacturers to paint the pictures. And perhaps paintbrush manufacturers shouldn't try to paint pictures.

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A Larger View of Control Theory: In Pursuit of the Ulom

By Tom Weathers, Jr. (296 Clinton St., Shelby, NC 28150). Copyright 1987 by Tom Weathers, Jr.

Introduction

Ever since being introduced to Control Theory (CT), I have been trying to arrive at a personally satisfying model of what everybody is talking about. Part of it has to do with my background. I am not a professional life scientist or psychologist and don't fully understand the jargon. However, that is not the real difficulty. The underlying principles of CT are simple enough to be grasped by anyone. In fact, not having a professional axe to grind probably makes it easier to get at the fundamentals.

Lately, some answers have been bubbling up from the murk. Bill Powers seems to think they are worth pursuing, so I am writing this short, informal paper to see if anyone else is interested in this slant on CT. (It should be understood that Bill is not to blame for any of this.)

A New Perspective on Control Theory

My problem has been with the claims that underlie and define CT research. Control Theory is not just an explanation of human behavior. It is also and perhaps primarily a theory of mind—all minds everywhere. The physical behavior of a system is simply the outward manifestation of the mind residing within the system.

Some might argue that the distinction is semantic, that mind is only a meaningless mirage resulting from behavior. I don't think so. Mind is the software that determines behavior. CT researchers attempt to understand the "software" of human systems by applying the scientific method to the behavior of the human hardware. This is necessary since the "source code" is not available and the "object code" is unreadable. However, we need to remember that the "code" is real, even though the "language" is strange and the "compiler" is still running after millions of years. Explaining the behavior of living systems without regard to the underlying mind tends to result in incomplete theories.

(Bill Powers does for mental software what Alan Turing did for digital software. Turing machines are subsets of mental machines, representing in humans only the upper, digitizing level in a many-level system.)

As described by CT, mind becomes a hierarchical system of nested feedback loops. High-level loops supply reference goals for lower-level loops; low-level loops constitute the environment for higher-level loops. Stated differently, mind is a system of connected goals. All mental activities involve the pursuit of goals and the associated control of perception. Mind is purposeful, directed. Intelligence is the ability to satisfy goals.

This view of mind is valuable because it defines mind as the *complete* hierarchical system, encompassing all the control levels.., from those involved in conscious goal-seeking to first-line, front-line visceral feedback functions. Past views of human mind have been restricted to highest levels of consciousness and vaguely defined unconscious levels below that. Past views of animal minds have been restricted to lower-level processing. Plants and machines have not been viewed as having minds at all. CT provides an integrated definition of mind that does as much justice to multi-layered systems as it does to single-layer systems. It is a view of mind freed from anthropomorphism.

(The old mind-body problem is put to a deserved rest; asking how mind interacts with body makes as much sense as asking how software interacts with hardware.)

In this view, a system has a mind when it contains at least some of its own reference goals. The system behaves in an independently intelligent fashion when it attempts to alter its perceptions to match its own built-in references. Every Living creature has at least some degree of mind and some intelligence, because every living creature possesses certain built-in references. As Bill points out, these references appear to occur all the way down to the DNA level of Living systems.

Since the industrial revolution, when it became necessary to "off-load" human control functions into machines, mechanical minds have become common. This is not to say that all machines have minds. Tools that are strictly extensions of human bodies don't have minds. Reference goals are provided by the human operator. Artifacts like books, pictures, and computer databases also don't have minds. They are simply snapshots of human minds. However, a real-time process control system does have a mind... is a mind. Some, but not all so-called AI systems have minds.

So it doesn't make any difference what kind of hardware is used to implement the feedback software that constitutes a mind. All that matters is that goal seeking/perception control take place.

The Larger Issue

Which leads to another, larger issue. If the behavior of mental entities is subject to certain objectively verifiable descriptions, then why should these descriptions have a status any different from the descriptions of other physical phenomena? Categorically, is CT something different from Newton's Laws of Motion or Einstein's Special Theory of Relativity? No. CT is a candidate for becoming law, just like any other scientific theory. And, like any other scientific theory, CT should not just be viewed locally. A basic tenet of science is that the universe contains no favored places. So, CT is a theory of all mind, everywhere. This seems outrageous at first, but why not? No matter where we go, we expect to find an equal and opposite reaction to every action, and we trust that E will always equal MC squared. A theory of mind, which likewise describes the behavior of physical systems, should be viewed in the same way.

(Are there multiple levels of ethnocentrism at work here? Do we resist views of mind that include other animals because we are human... just as people still resist the concept of evolution? Do we resist general scientific theories of mind that include non-living entities because we ourselves are living creatures? Is HAL any less deserving of our understanding than Hal?)

Some Implications

What are the implications of all this?

First of all, CT strongly suggests that there can be universal scientific laws regarding mind, just as there are universal laws (or at least theories striving to become laws) describing all other natural phenomena. Whether right or wrong, CT is, I believe, the first true candidate for the Universal Law of Mind (which I like to call the ULOM... as though it were a mystical incantation).

As the ULOM, CT expands our universe. In return for giving up our narrow, human-centered perspective, we gain a universal law of mind. Such a reorientation is always painful; look at what happened when Galileo expanded the physical universe and Darwin expanded the temporal universe of living things.

With the new perspective gained from CT, we might better appreciate our own minds and the minds of other entities. Perhaps some of the scientists who read this paper will be less cavalier in their treatment of so-called "lower-order" test subjects if they realize the similarity of those minds to their own. (A recurring theme in speculative fiction is the possibility that one day a higher mind will judge our species by the way we treated other creatures.)

Understanding that the same basic principles apply to all minds, we should be better able to apply studies of one kind of mind to another. Not only can I see how my mind and the minds of my Toyota, cat, and dogs are similar, I can also see how they are different. Not having to defend my own mind as being totally unique and special, I can begin to see its real differences and distinctions.

CT has a special impact on the concept and pursuit of Artificial Intelligence. At the outset, the term AI is found to be invalid. There is no distinction between "real" intelligence and "artificial" intelligence. There is simply intelligence occurring at various levels in various systems. Also, the pursuit of machine intelligence is not something that started 20 years ago with the introduction of LISP. There have been intelligent machines ever since feedback systems were used to control the pressure and speed of steam engines. Furthermore, the goal of reproducing human minds and intelligence is by definition flawed. As CT shows, a mind is the result of all the reference levels within a system, from top to bottom. It is an evolutionary accretion of intelligence from past ages. To reproduce the functions of a human mind means reproducing all those levels, down to the biological and molecular. That might be possible, but the result would surely not be anything "artificial."

Summary

This paper has one basic point to make: CT is a theory of mind, not just human minds, but all minds everywhere. As such, it may be the first true candidate for the Universal Law of Mind (what I euphemistically call the ULOM).

The existence of a scientifically based ULOM (whatever you want to call it, whether founded on CT or some other theory) will have a revolutionary impact on humanity. Just as other revolutionary theories have done in the past, it will ultimately force us to reassess what it means to be human. Considering where our present concepts of humanity have brought us, such a reassessment is probably long overdue, perhaps even necessary, if we are to survive these minds which we have so much trouble describing.

Love Guaranteed or "The Job of Loving"

Review of *Love Guaranteed: A Better Marriage in Eight Weeks,* by Edward E. Ford, M.S.W., Harper & Row, San Francisco, 1987, 124 pp., ISBN 0-06-250344-8 (available for $10.95 postpaid from Ed Ford, 10209 N. 56th St., Scottsdale, AZ 85253), by John R. Neill, M.D. (Department of Psychiatry, University of Kentucky Medical Center, Lexington, KY 40536). Copyright 1987 by John R. Neill.

How could anyone argue with Ed Ford? His book is dedicated to his parents ("I could not have had better parents"). He is a married man of some 35 years, has raised eight children, and is a successful marital counselor. He is also a member of the Control System Group organized by William T. Powers and others. In this book, Ford attempts to use Control Theory, as developed by members of the Group, as a framework for his therapeutic work. Control Theory teaches, among other things, that behavior is "caused" by the organism and not by the environment. Persons are not "pawns of environmental forces" but are rather "goal seeking and purposeful." The author promises a "money back guarantee" that one's (troubled) marriage will improve in eight weeks if there is a genuine commitment by the couple to follow his prescriptions.

Why do marriages go wrong in the first place? We find this at the end of the book. "The emphasis within our own culture seems to be centered on the physical aspects of a relationship, such as sex, looks, and ability. Second, we have spent the last twenty-five years in our country developing a self-interest concept..." (p. 113) This sounds like another indictment of our "narcissistic" culture, where it would seem that the difficulty in marital relations comes from individuals not really knowing whom they have married—rather, they impose their own value

standards, judgments, and perceptions upon the other and react unfavorably if these are not congruent. In short, the treatment is to make each spouse empathic with the other. This is done by setting aside special time (Quality Time) where spouses are briefly together, actively collaborating on mutually shared tasks such as taking a walk, playing games, making things, etc. In "healthy relationships" this should take up a half hour daily. Of course the crucial thing is attitude. Before one enters this period, one adopts a non-critical-judgmental mental set in order to perceive more accurately who the other person is. The author and Control Theory contend that we construct our own preconceptions of how others should be and that when these are not met by the other's values and activities, dissonance results.

This is all at the end of the book. The bulk of the book is a sort of Socratic dialogue between the author and a "typical" couple, Mark and Linda, who seek his counsel. Socrates, as it were, demonstrates how we cause our own troubles through dis-perceptions, how our own desires become expectations, and how when there is a mismatch between the perceived and the expected, distress results. That's the long and short of it as I read it.

I think it would be useful to give a bit of the dialogue to show the flavor of the work:

"I see," Linda said. "Every time I get mad at Mark, what really is happening is that what I want Mark to be doing is different from what I perceive him doing."

"Right," I [Mr. Ford] said.

"Well then," Linda continued, "why is my first reaction to get mad?"

"You choose getting mad at Mark as a way to correct that difference, or, to put it more simply, to change him. But as we've already discussed, you can't really change another person, only yourself... People don't cause us to do the specific things we do. Their behaviors are perceived and often judged by us, but they don't have control over us." (pp. 40 & 42)

The body of the book consists of the explanation of the facts of Control Theory by the author to these ever so patient, intelligent, extremely cognitively oriented young people. This includes the ten levels of perception, which range from sensation to systems concepts, and the three variables that interact with these constructs.

The question at hand is whether Control Theory is applicable to marital counseling. Apparently it is, in the author's opinion. Others who have tried this method say it "explains what they were doing intuitively when the work was going well." The author maintains that Control Theory is "just common sense." As presented, I think this approach would work for intelligent younger people, who want to "work on their relationship"—certainly a rather modern idea. However, if you add affairs, physical and verbal abuse, alcoholism, stubbornness, guilt, self-righteousness, impulsivity, passive aggression, hatred, socioeconomic chaos, etc.—the stuff of which a lot of marriages that go wrong are made of—there may be a bit more trouble. This very cool air-conditioned didactic approach might not work so well in such situations. If indeed the author speaks as he does in the book, which I doubt he does, it would take at least a baccalaureate degree to follow him, let alone transfer his abstract explanations into concrete experiences.

In this sense, the title of the book is a bit misleading. It suggests that *by reading this book* you can have a better marriage in eight weeks. I think you could have a better marriage in eight weeks if you worked with Edward E. Ford, who appears to be an intelligent and compassionate counselor. For therapists in training, this manual would be of some interest, although the trainee might ask the author for more art and less matter from his discursive presentation.

Re: *CC* Number 7

By Michael Luke Aitken (Box 172, Honaunau, HI 96726). Copyright 1987 by Michael Luke Aitken.

Miro Valach's "validation of subjectivity" is supported by a turnover in the last few years in the field of literary criticism. The work of the French writer/critic Derrida is directed at demolishing the artificial dichotomy between works of literature and the products of critics who evaluate such literary efforts. By emphasizing the personal "scent," as Dr. Valach puts it, by utilizing a recursive writing style that constantly reveals, reinforces, and revels in the self-consciousness of the critic as creator, Derrida and his emulators have exposed with painful clarity the pomposity of the posture that an assumption of critical objectivity requires. (Is my tone sufficiently severe and elevated to invest my point of view with authority? If not, I encourage constructive catcalls from the audience.)

Needless to say, this has generated considerable energy in the critical "body politic" directed at isolating and marginalizing Derrida's influence; this process is itself an interesting example of the constellation of ideas presented by Goldstein, Robertson, and Ford. There are thoughtful analyses of Derrida's work available, however, and I strongly encourage other cross-disciplinarians to read *Deconstruction: Theory & Practice,* by Christopher Norris, for an unusually accessible treatment of the subject. My hope is that attention to this work will have a salutary unstiffening effect on the prose presently being sacrificed on the holy altar of Professionalism. Can you dig it?

Now, about profligacy and amortization. Since I gave up teaching English to move to a rural community and gestate a farm out of nine acres of virgin subtropical rainforest, I've had to come to terms again and again with the need to invest time and energy, in ways that made no sense at all in the short term, in order to eventually create the lifestyle I desire. Dealing with those short-term dissatisfactions required the use of Ford's suggested redirecting of the energy generated by those dissatisfactions into a "what's the next step" survivalist orientation, as described by Valach, in order to realize my long-term goal. (See *Playing Ball on Running Water,* by David Reynolds, a discussion of Morita Therapy, which can be summed up in the phrase "OK, I do feel that way... now what's to be done next?") As the compromises I was forced to make were numerous, and thus the reminders of my dissatisfaction frequent, I was blessed with an abundance of energy to redirect, and I now find myself comfortable enough to spend time writing letters like this one.

The point is that without any awareness of Powers or cybernetics, my behavior seems to have embodied much of the theorizing in CC #7. Interesting, no?

Just one illustration of the kind of loops I've had to set up to make this life work for me: Seven years into this experiment, I went broke. With three more years of land payments, weeds living the carefree life that goes with the prospect of never suffering a killing frost, and a location 20 miles from town in an area that rivals Appalachia in its lack of economic opportunity, I had to leave home and find a job, yet still maintain the farm and prepare for my eventual return, without sacrificing the social ties I cherish or plugging back into a job market I find abhorrent.

So I found work on another farm, utilizing skills developed on my own, honing them until I could develop a local reputation as a legendary landscaper specializing in stone work, charge accordingly, and find people who could afford to pay me. Simultaneously, I bought a 1965 International half-ton truck and started a small mulch and compost hauling business to give the truck a self-supporting business as well. This paid my way to town twice a week, allowing me to shop for supplies and to begin to accumulate what I needed for my own farm. It also connected me to suppliers of the things I needed most, positioning me to take advantage of whatever special opportunities cropped up.

Since I couldn't afford to pay a mechanic, I learned how to do my own work, spent my truck earnings on tools, cultivated mechanics as friends instead of creditors, got into dismantling old wrecks they located for me, and accumulated a parts stash.

Now I'm in the process of building a garage and parts shed at home to protect my investment to date, all the while continuing my hauling and landscape businesses, being my own mechanic, and trucking the loads for my farm that got me into all this in the first place. The set-up costs for all of these systems are staggering, especially if each is costed out separately. But nested as they are, the synergy of their interrelationships is gradually making the whole operation self-supporting, leaving me free to monitor the system, fine tune it, and cast about for other compatible subsystems to plug into it—such as an irrigation/drinking water/sanitation/ aquaculture/agriculture system that makes effective use of two thus far wasted resources (abundant rainfall and steep land) to enrich the other systems already in place.

I offer this somewhat protracted personal history in response to W.D. Williams' request for feedback on alternative economic models. The microeconomy of the individual consumer, and thus his/her vulnerability to the cynicism of supply and demand economics, is to a large degree dependent on the effectiveness with which the individual is able to nest the complex of subsystems forming his/her total economic activity. That autonomy, or lack of it, seems to be the missing element that Williams is pointing at.

Reflections on the St. Gallen Conference

By Larry Richards (Department of Engineering Management, Old Dominion University, Norfolk, VA 23508). Copyright 1987 by Larry Richards.

The first Special European Conference of the American Society for Cybernetics was held at the University of St. Gallen, Switzerland, March 15-19, 1987. About 100 people attended. I would like to make a special note of appreciation to Gilbert Probst for agreeing to host the conference and making the necessary arrangements.

I detected a number of stimulating intellectual issues arising during the course of the Conference. I regard these as healthy developments and would like to comment on some of them. I would also like to invite others to submit their opinions for publication in *Continuing the Conversation.* The issues I would like to discuss revolve around two of the evening presentations, "An Interview with Bill Powers" and "Designing Society," although the issues raised were, in my opinion, intricately connected to almost all other aspects of the Conference.

The first issue has to do with the role of control theory in cybernetic inquiry. I heard (and overheard) a number of comments to the effect that control theory was getting too much attention and that this attention might have the effect of reverting the field back to what it was in the 1940s and 1950s (a point on which I disagree, by the way). There is little question of the historical significance of control theory. *Norbert Wiener* coined the term "cybernetics" for the emerging science of control and communication. However, "cybernetics" has come to have a much broader significance to many active cyberneticians. As near as I can tell, this reframing of the field began with the "Cybernetics of Cybernetics" project at the University of Illinois. Humberto Maturana suggested to me in St. Gallen that he would like to see the word "cybernetics" used to refer to "the art and science of understanding." While I tend to favor this orientation, I think it also presents some pitfalls. The epistemological focus being proposed could easily converge toward one dominant way of thinking about understanding (e.g., constructivism, etc.), resulting in the exclusion of other approaches. Since I regard understanding as primarily a social (and dialectical) process, I interpret an "art and science of understanding" as requiring divergent approaches, the differences providing substance for conversation. It is in this

context that I see an extremely important role for control theory. I personally do not have any direct interest in the application of control theory to human physiology; my interests are more in the interactions among "control systems," especially when one of the "control systems" is myself (ugh!). While I would not deny that an understanding of human physiology and psychology could be important to understanding interactions among humans, my perception is that the control theory model has not been sufficiently developed to be of much use in the social domain, and is not likely to be in the near future (although I am ready to be corrected on this point). My interest in control theory is not, therefore, so much in its content (although I find some of that fascinating) as in the underlying epistemological assumptions, even the denial of epistemology. I think that this extreme view of "the art and science of understanding" provides one of the divergent approaches so necessary to establishing a dialogue. Whether the personalities involved are willing to enter into such a dialogue is another question. *I am willing*—and excited about what new ideas might emerge from the clash of these differing points of view (which, of course, says something about my own "epistemology").

The second issue has to do with what I perceive as differing uses of certain key words, resulting in some frustrated discussion at the Conference. However, I do not see this issue as merely a "semantic problem." I regard the differing uses of these words as embedded in certain ways of thinking, and those ways of thinking need to be made explicit and themselves discussed. The two words I would like to provide observations on are "society" and "utopia."

I heard the word "society" being used in at least three different ways: (1) society as all the people and the interactions among them, (2) society as all the institutions that make it up, and (3) society as the constraints that emerge from the interactions among people and institutions. I would like to make a case for using the word "society" in the third sense above. If society is all the people and the interactions among them, then society is an organization. I would suggest that we do not, in general, use the words "society" and "organization" as synonyms (the American Society for Cybernetics being one gross exception). This is not to say that people and interactions are not important to an understanding of society, but rather that when I use the word "society" I am not referring to all individuals and their daily interactions. I am referring to the constraints within which those individuals interact. These constraints are both explicit and implicit, and include laws, morals, ways of talking, available knowledge, value systems, ways of thinking, etc. The institutions which make up society are manifestations of these constraints, the static products of an ongoing process. If society is to be thought of in a static way, then these institutions may provide one way of describing it. I prefer to think of society in a dynamic way, as a phenomenon that is continually changing. Society as constraints permits me to do this much more easily than society as institutions does. The importance of the distinction I am trying to make is that in talking about "designing society" we need to be clear about whether we are talking about facilitating interaction, creating institutions, or clarifying and transforming constraints. For those who would say that they do not believe in designing society, dismissing this activity as social engineering, I would contend that whenever two people enter into conversation they are designing society, and that reflection on the language of conversation is a "conscious" process of designing society. Constraints are implicit in the language used, molding the patterns of possible interactions; new constraints emerge from the interactions and get embedded in the language.

The word "utopia" has a history of bad repute in cybernetic discussions. I heard more than once at the Conference statements like "utopias are not cybernetic." Certainly, when one reads a chapter entitled "The Utopia Syndrome" from a respected book on "cybernetic" therapy, there may be good reason to dissociate

oneself from the word. However, I began to hear the word used in a different context in St. Gallen, and the theme of the next ASC Annual Meeting is "Creative Cybernetics: Our Utopianists' Audacious Constructions." If I were to use the word "utopia" to refer to the specification of some perfect (ideal) future as a precondition of design, with rational planning being understood as the appropriate mode of design for achieving this future, then I would indeed tend Lo use the word in a disparaging way. On the other hand, if I am to participate in change, and do so in a reflective manner, I would at least want to think about the desirability of proposed changes; hence, I must assume that some proposed changes are more or less desirable than others. As soon as desirability enters my thought process (and I would challenge anyone to demonstrate that it does not enter theirs), then my actions (and in particular my ways of interacting with others) take on utopianist intentions. What I need to remember is that what is desirable for me may not be desirable for others; one of my overriding desires is, therefore, to be able to talk about desires with others. In this context, the word "utopia" becomes process-oriented, with ideas about desirability in continual flux. I suspect that there are some different opinions about this, and I hope that a clarification of these differences can occur by continuing the conversation in this newsletter and at the Annual Meeting (December 2-6, 1987, Urbana, Illinois).

ASC News

For those who have not renewed membership in the American Society for Cybernetics for 1987 and are not independently subscribing to *Continuing the Conversation*, this is the *last* issue you will receive unless we hear from you. If your CC mailing label is *circled in red*, it means our records indicate that you have *not* renewed your membership for 1987. If there is an error or if you have any questions, contact Larry Richards, Department of Engineering Management, Old Dominion University, Norfolk, VA 23508; phone (804)440-3758.

For those waiting to receive the 1986 (Volume II) issue of *Cybernetic,* it should be in the mail about the same time as this newsletter. It is being sent to all 1986 subscribers and to all 1987 ASC members. While it would be difficult to improve on the quality of the content of Volume I, Paul Trachtman may have accomplished just that. In addition, the print and paper quality have been significantly improved. If you have any interest in seeing this

endeavor continue as a Society activity, it is extremely important that you support it by renewing your membership and making whatever other contributions you feel are appropriate. (Yes, this is a plea!) Current subscriptions are not even close to being able to support the magazine, but we are proceeding under the assumption that a high quality magazine will attract a sufficient number of new members and subscribers to permit continued publication. *Please* let your friends and colleagues know about ASC, *Cybernetic,* and *Continuing the Conversation.* Who knows? They might be interested!

Any 1987 ASC member who has not received the *first* issue of *Cybernetic* (Volume I, 1985) may obtain a copy by writing or calling Larry Richards. *Two* issues of *Cybernetic* are now planned for 1987 (Volume III), and the magazine is scheduled to become a *quarterly* in 1988. There will be further news soon on changes in the production process for the magazine.

Control System Group Meeting Dates Changed

The Control System Group's 1987 Meeting has been rescheduled to October 7-11, still at Kenosha, Wisconsin. For details, contact Ed Ford, 10209 N. 56th St., Scottsdale, AZ 85253.

Ph.D. Students Sought

The Department of Engineering Management at Old Dominion University is initiating a doctoral program with a cybernetic orientation beginning this fall. Areas of concentration include Sociotechnical Systems, Human Performance Engineering, Knowledge Systems, and Science, Technology, and Society.

For more information, contact Dr. Laurence D. Richards, Dept. of Engineering Management, Old Dominion University, Norfolk, VA 23508.

Explanation of Address Label Codes

If you are *not* a member of the American Society of Cybernetics, above your name on the address label is either a number or "comp." The latter means that you have received this issue with our compliments, and that you will *probably* continue to receive issues free (though you might want to subscribe to *guarantee* future delivery). A number indicates the last issue on your subscription; if there is a "9" on the label below, it is *TIME TO RENEW*—please do it *NOW*, as no renewal notice will be sent. Thank you!

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Continuing the Conversation

A Newsletter of
Ideas in Cybernetics

From the Editor

Angels Fear: Towards an Epistemology of the Sacred, by Gregory Bateson and Mary Catherine Bateson (Macmillan, New York, ISBN 0-02-507670-1) was published in July, but so far I've seen no reviews in the establishment media of this final volume in the Gregory Bateson canon. The neglect may be excusable (though not admirable) because *Angels Fear* is a very important yet difficult book. It isn't *overtly* difficult, especially for readers steeped in previous Bateson writings and lore; rather, it is covertly difficult, raising questions which it leaves unanswered and which, perhaps, should not be answered. Some readers (and reviewers) will need to "complete" these difficult questions with answers of their own, and perhaps will become enmeshed by that activity. Some will be satisfied by the "incomplete completeness" of the questions alone, and then stop there. Some will be unsatisfied, and then stop there. A few will be led to ask their own difficult questions, which extremely rare result makes the book so important.

My fascination with the patterns of incompleteness in *Angels Fear* prompted me to invite personal reactions to the book from several Bateson appreciators. I was curious to see how each would deal with the incompleteness: criticizing, accepting, rejecting, perhaps synthesizing. Responses from 14 individuals are printed in this issue of CC; several more will appear in the next issue (and I welcome additional responses, and responses-to-the-responses; deadline for CC #11 is December 4th). I'm pleased to see some synthesis occurring—may it flourish!

The article by Dan White serves as a bridge to the unfinished business (Torn Bourbon has termed it "Continuing the Consternation") of examining conflicting approaches in and to cybernetics. I particularly want to invite comments on Stuart Umpleby's paper. Though addressed to the American Society of Cybernetics situation, it raises the fundamental question of how we shall agree to disagree—of how we shall make sure that our conversation continues.

Recollections

By Neill Kramer (74 Arvine Heights, Rochester, NY 14611). Copyright 1987 by Neill Kramer.

In 1983, I wrote a thesis entitled "The Implications of Gregory Bateson's Ideas for Contemporary Education." In it I surveyed Bateson's ideas, from his early days as an anthropologist to his major work *Mind and Nature.* I remember struggling with the concept of logical types, until one night, driving home in the fog, the reality of the idea hit me. I had just finished viewing the West German film "Das Boot," and I recalled a scene where soldiers in a Nazi submarine had been trying to destroy a fleet of battleships. They had made a direct hit, when soon after a depth charge sent the sub to the bottom of the ocean. Before the pressure of the deep became too great for the sub, it touched down. After making the necessary repairs and getting the engine started, the sub returned to the surface and made contact with the battleship it had previously hit. The ship was on fire and men were in the water, screaming. Even some of the water was in flames. The men in the sub were obviously overwhelmed by the suffering

of these fellow human beings, but were left no choice but to let them drown.

The realization I had was that in the class of a fleet of battleships, a member of that class was a single battleship; then where individuals come into play is in the class of members of a single battleship. There are no individuals at the next level up, where members are battleships in the class of a fleet of ships. And whereas the soldiers in the sub were ecstatic when they torpedoed the single ship, they were horrified later to see that human beings were dying before them.

Thus it was revealed to me that Mind *does* operate according to "logical types." We are subject to hierarchical patterns of thinking, which patterns are themselves dependent on context. And since the context is always shifting, we need to rely on something like metaphor to decode the new context.

Much of the legacy of Gregory Bateson may be in his ability to pay careful attention to processes that much too easily become delegated to our unconscious. That is perhaps why in the end Bateson felt that some patterns of thought should be left on their own.

Yet he also was quite clear about laying a groundwork ("What Every Schoolboy Knows"). It appears that Bateson's religion can be the equivalent of letting Creatural knowledge unravel itself. Once we label a complex mental process, we lose something of its spontaneity. The "pattern which connects" may resemble an amoeba, where a section of protoplasm gropes forward in one direction, but other sections grope too—behind the groping is a consistency, a tautology, that keeps the system from falling apart.

It could be that Bateson's Eco and the Tao are one and the same.

Random Thoughts on *Angels Fear*

By Mark Siegeltuch (20 Dongan Place, New York, NY 10040). Copyright 1987 by Mark Siegeltuch.

I was not surprised to find Bateson moving so easily through Augustine and Aquinas in *Angels Fear.* You might suppose, on the face of things, that cybernetics would have little to offer in the study of ancient and medieval cultures, but this has not been my experience. Analogy is the royal road to understanding all oral and manuscript cultures, past or present. The central role of memory in perpetuating these cultures generates formal patterns of organization which are remarkably ancient and remarkably stable over time. This is why we find such similarity in religious doctrine, folklore, art, and architecture throughout the world. With the death of the comparative method after World War II, American universities embarked on a program of specialization in all areas of history, religion, and anthropology which has all but obliterated these "patterns which connect." You have to return to writers like the late Amanda Coomaraswamy to get the full flavor of medieval and ancient thought. He wrote, in "Primitive Mentality" (reprinted in Roger Lipsey, ed., *Coomaraswamy,* Volume 1, Princeton University Press, 1977, 286-307), "To have lost the art of thinking in images is precisely to have lost the proper linguistic of metaphysics and to have descended to the verbal logic of 'philosophy.'" (pages 296-297) Here we have our "syllogism in Barbara" and our "primary process" at work as organizational principles

for a whole culture. Or we have the words of Rene Guenon in *Orient et Occident:* "What we mean by a normal civilization is one that rests on principles, in the true sense of the word, and one in which all is ordered and in a hierarchy consistent with these principles, so that everything is seen to be the application and extension of a purely and essentially intellectual or metaphysical doctrine: that is what we mean when we speak of a 'traditional civilization.'" These forms of organization, which were opaque to my university professors, presented no problem to Bateson. His remarks about magic and religion show me that having the right approach to your material is far more important than knowing all the details. Magic, as Lord Raglan pointed out in *The Origins of Religion,* "consists in performing rites without having learnt, or through having forgotten, their theological background."

What interests me is the w ay our information environment, with its stress on pattern recognition rather than analysis, has retrieved ancient culture and made it intelligible again. To be fair, none of this would have been possible without all the centuries of painstaking analysis carried on by clerics and academics. The same may be said of Descartes in relation to cybernetics, whatever the distortions he introduced. Still in all, as Bateson reiterates in all his works, we need a better epistemology if we are to survive. This includes a better understanding of our own history which is far more exciting than most history teachers would have us believe. To give Aquinas the last word:

> Omnia exeunt in mysterium.

"All things fade into mystery," a thought Gregory Bateson would have appreciated.

Rushing In

By Avery R. Johnson (Armory Rd., Milford, NH 03055). Copyright 1987 by Avery R. Johnson.

With half a lifetime of committed atheism behind me I have often found myself looking for cubbyholes other than "religion" in which to put the explanations for experiences of certain kinds. For the past few years I have even been at work on a book of exposition, starting at ground zero from *physiological* arguments, that builds up the whys and wherefores of our human obsession with "things," cause-and-effect, and diachronic time. It details also the inevitable invention of "gods" as religious explanatory incorporations and would thereupon dismiss these last occupants of that cubbyhole. But *Angels Fear* has led me back to take another look and has challenged me to retrieve from their "safer" assignments the experiences within ourselves that all of us would do better to share and nurture and trust. I don't know yet if I want to call that place "religion," but it seems a better candidate than any other.

I would like to present in this essay the consequences of what I believe to be the particular "most recent" central nervous system mutation that produced both the unique wonders and the considerable mischief of humankind's mentality (1). I want to talk only about its consequences without elaborating the lengthy physiological, systematic, and computational arguments that should go with them (and that are at least convincing to me) because Greg Williams is publishing a newsletter, not a book. I value this audience as a forum in which to present this material, for, as I read both Batesons, I keep seeing support for my thesis. I hope I am not Maslow's man-with-a-hammer, seeing everywhere only nails.

Throughout Gregory's account of human behavior and mentality runs the recurrent theme of an ancient use of language and awareness of relationship which has been lost or at least overlaid with a grinding fixation on Pleroma: "thingness" and an "objective understanding" of questionable validity. I share the belief that *Homo sapiens* has possessed verbal language as an elaboration of

oral/aural gesturing for perhaps a million years, while it has only been 100,000 years or less since something happened abruptly to alter the personal and social functions of that language (see p. 30 of *Angels Fear).* By analogy, the former mode of thought was likely similar in mood to your awareness of your circumstances when your car malfunctions and you must take it for repairs. You experience the irritation about the unwarranted time you are losing, the gratuitous expense of the repairs, and the need right then to be somewhere else—a clutch of feelings which are in this case mostly uncomfortable. The mechanic, on the other hand, is analogous to modern humankind: he will listen to the engine's symptoms and visualize its moving parts. He will be aware of the tools that he will need, how they will feel in his hand, and the steps necessary to effect the repair. His world at that moment is comprised of things and their material and temporal transitive relations; yours is of intransitive matters, and your internal clock has virtually stopped.

The subtle cortical mutation (enhancement) that occurred about 100,000 years ago had made it possible finally for the brain to manage a very difficult trick. To a neuronal computer whose elements can compute nothing more than relations of differences—and, within a network of these components, ever more vastly complex further relations of those relations—the task of forming a percept of a "thing" is immense. It consists of holding a particular set of experiential relations stable—independent of a change of background or of frame of reference or of the creature's own ongoing behavior—sufficiently long in time and free from ambiguity that the trick can become useful and valuable. The usefulness is to be found in the ability to make subsequent identifications of the same thing and to generate a representation—a name—that can be shared with another human so to signify its presence. Such a feat represents a huge step forward even for a brain already producing a language capable of social organization and interactions of a here-and-now variety. Listen to Gregory from an article in *Steps to an Ecology of Mind:*

What was extraordinary—the great new thing—in the evolution of human language was not the discovery of abstraction or generalization, but the discovery of how to be specific about something other than relationship. (2)

The age of reification began as an awareness of Pleroma that could not thereafter be renounced. Where language had been wholly connotative, it now became also denotative and centered more and more around the noun. A commitment to the counting of things arose along with tokens and marks on tally sticks as the means for representing numbers even before those numbers were given names. Symbolic writing emerged to represent things as well as numbers, but it was to be a long time before alphabets were invented as rebuses for human speech sounds. Lists and more lists became the order of the day, and the grandest of them may have been Father Noah's. He had had the inspiration to create a taxonomy of all the earth's known animals: a list that was then to be kept safe "in an ark" like that for the Torah.

But the act of reification does not just bear upon our perception of the spatial and material aspects of experience. It necessarily also brings an awareness of temporal sequence—of "event time." Eliade (3) wrote eloquently of a primitive sense of *sacred* time ("synchronic" in *Angels Fear)* in which the performance of a ritual is not perceived as a reiteration of an ancient act but *is one with that very act.* As an awareness of the flow and segmentation of *profane* ("diachronic") time emerged, humankind could begin to fragment experience, name the fragments and communicate about them, agonize over their passage, and adopt the notion of cause-and-effect.

There was yet another general consequence of this cortical enhancement, an effect combining the spatial, material and temporal parsings of experience. Given the perception both of separable objects and of time sequences of events, humans could now discern whether the act of another was intended. The skill requires a capacity to perceive and anticipate sequence and to identify the objects involved. The perceiver should at least be

sensitive to the contextual aspects of the act, but is not always so. All vertebrates can perform intentionally, but it takes a human brain to be able to isolate, identify, and name that quality of an act. Intention was, in effect, reified. And of course, being the generalizers that we are, the attempt to identify an intended cause as the origin of any and every event—whether of creatural origin or not—led to all kinds of mischief. People sought thus to account for the rising of the sun, the coming of storms, spots on the fruit,... death. Initially many household gods were invented as sources of the intentions behind the many happenings in daily life but, as it became apparent that some phenomena are natural outcomes of others, the gods that remained were those that were responsible for significant, terrifying, agonizing, life-menacing or otherwise unexplainable events. The more modern versions are in the form of "One God" to stand as a single source for all extrinsic intention.

In Chapter V of *Angels Fear,* Gregory addresses the controversy over whether magic is the outgrowth of religion or vice versa and concludes that "The criterion that distinguishes magic from religion is, in fact, *purpose* and especially some extrovert purpose." I think that the statement is perhaps true of the rituals of religion but does not answer the broader question as to why religion is such an inevitable construct among human beings. I think that humankind's tendency to ascribe *intending* (correctly or not) to events of unconfirmed agency is the fundamental origin of religious practice.

But what of that other aspect of religion that keeps welling up in *Angels Fear:* the abductive leap, the healing power of the placebo, the ineffable that-shall-not-be-named? We see it in the performance of Olympic athletes, in our own simple moments of recognition or insight, in acts of incautious heroism, and in the great moments of Art. It is in the oceanic feelings brought on by a sunset and in the glance or touch of a lover. It is personal but it can also be shared. It does not come from "out there" (nor is it an "it," anyway) since it comes from the part of us that was "in here" long before the ability to reify struck us with its gifts and curses. The gifts of the capacity to fragment and name are unmistakably advantageous to us, but we most also let ourselves know how to be unattached and at such times not to carry our habitual formulations with us. Consider: neurosis appears to be a pathology of the *interpretation* of intention; psychosis, a pathology of its *expression*.

The story of Adam and Eve is a recognition of our loss of innocence while becoming sophisticated, knowing, fragmented, attached,... conscious. But we never really lost that earlier awareness, we just misplaced it. Our innocence still lies beneath the veneer of culture. The acknowledgement among us of a new religion of process and relation—without gods or altars or icons—perhaps with words written or memorized, but none mandatory -with dance, but not choreographed—can gradually bring us to value both of Gregory's descriptions of humankind.

(1) For the neurologically inclined: the angular gyrus in Wernicke's Area is an "association area of association areas" and has existed in humans, free from limbic connections (see Norman Geshwind, "Disconnexion Syndromes in Animals and Man, Part I," *Brain 88-II,* 1965, 237-294), for perhaps a million years. About 100,000 years ago, its neurons received their myelin sheathing. That computing enhancement in that particular place made the difference.

(2) Gregory Bateson, "Problems in Cetacean and Other Mammalian Communication," in *Steps to an Ecology of* Mind, Ballantine Books, New York, 1972, 367.

(3) Mircea Eliade, *The Myth of the Eternal Return,* Princeton University Press, 1954.

Reactions

From John R. Neill, M.D. (Dept. of Psychiatry, University of Kentucky, Lexington, KY 40536). Copyright 1987 by John R. Neill.

You ask about my reactions to the book *Angels Fear.* I must disagree that *Angels Fear* is an important book either for me, or, I venture to guess, for any but the heartiest of Bateson "fans." The subtitle is exciting -"Toward an Epistemology of the Sacred"—but Bateson doesn't get very far, not much beyond *Mind and Nature* to my reading. I was not only disappointed but embarrassed. With a few exceptions such as the polished chapters II and XI, I feel I am listening to a great mind gone to seed.

In this last book there is more confusion than profundity, more disconnection, more self-indulgent rambling, than I've seen in any of Gregory Bateson's other writings. There is no sustained attempt to lead his audience by reasoned example to his admittedly tentative conclusions. Perhaps this can be excused. It is understandable. There is the dramatic "race with death," the dutiful daughter in attendance, the piles of tossed-off tape recordings, the need to speak in story and metaphor, etc. This comforts me somewhat.

I very much like Bateson the man. He is like Harry Stack Sullivan (whom Bateson admired) struggling to understand the world by wrestling with his own demons. I admire his stamina in the face of his own loneliness. This dedication to the quest is the other side of his intellectual *noblesse oblige*. Like the elder Jung, too a wrestler with personal demons, Bateson became, for me, in his last years charming.

While Jung is in mind, I think of his notion of the persona. I think Bateson cultivated a persona near the end—the scout, the hinter, the pointer, the chastiser of the "big boys," the Englishman playing it up for his American cousins. I believe he realized again and again that he cast his lot with "thinking," but he was not to be a great thinker. He was a great friend to thinkers, though, but probably a gadfly nevertheless. I have listened to 20 to 30 hours of Bateson on tapes, and I've never heard him engage in a sustained discussion of a point, say, with Carl Rogers—no great thinker, really.

Well, back to *Angels Fear.* I think I found there the most strident exhortations to think clearly, and the clearest demonstration that Bateson could not. Yet he tries and tries and tries. As a scientist, he knew his work would be superseded; he hoped it would be carried on. The fear he had, which I think he once expressed poignantly, was that he was talking to himself, that there was no correspondent "out there." For me, he will continue to provide inspiration by example, but not by precept.

A Metalogue on *Angels Fear*

With Douglas Flemons (2210B 35th St., Lubbock, TX 79412), Jerry Gale (3101A 75th St., Lubbock, TX 79423), and Wendel Ray (1307B Avenue X, Lubbock, TX 79401). Copyright 1987 by Douglas Flemons, Jerry Gale, and Wendel Ray.

Wendel: Brad Keeney said to me once upon a time that what Gregory did was to make a greater machine. That his perspective was fundamentally mechanistic—in fact, you could think of it as being a giant machine metaphor. That isn't exactly what Brad said, but in essence what I took away from it. But I got the feeling, too, that he said in *Angels Fear,* "I am a scientist and I don't believe in the mechanical or the supernatural."

Douglas: Well... even though Gregory talked about machines, I don't think he was looking at a mechanistic view of biology or mind, just sharpening his thought so he didn't get caught up in messy thinking.

Wendel: I liked Mary Catherine's metalogues.

Douglas: Yes, she was able to get "between-the-lines."

Wendel: There are one or two points where I felt a real arrogance in this book, a feeling that "we have found it."

Douglas: On whose part?

Wendel: Well, I can't really say it came out of what Gregory was... it was very... Gregory seemed very... rigidly open. He had a definite way of thinking about the world, and he did think there are better and worse ways, epistemologies; he was pretty straightforward about that. It may have been coming from Mary Catherine, a feeling of reifying Gregory's place in history...

Jerry: My sense of it is that these are touchy things to talk about without reifying them, too. It's really tricky to use language or whatever to bring about communication, but there is the sense to what he said that there are good and bad epistemologies, good and bad ways of realizing how we organize our reality.

Wendel: And consequences of that.

Jerry: Dangerous consequences—which goes back to ecology. So how can you avoid it?

Wendel: I don't think you can. What I hoped would be gotten into more is how all this is connected to ethics. In the introduction, it says that the book is about ethics—how anthropology is about the business of local ethics, and how that connects to greater ethical or ecological concerns. And I really thought that there would be more of a... maybe the whole thing *was* about that.

Douglas: To me it was about ethics to the extent that it was about humility, although you recognized arrogance. What I saw throughout was "my fellow scientists are much too arrogant about what they think they know." That this approach, rather than being a religion which is arrogant in its answers and humble in its questions, is arrogant in the questions and humble in the answers accepted. Bateson was asking fundamental questions, and it seems he was saying that his fellow scientists are much too arrogant in their incapsulated views of the world and see no need to stretch out and make connections. And there is humility too in not providing all the answers. I mean you don't read this and come out and say, "Oh yes, now I've got all the answers." He *has* asked the questions.

Wendel: It was very bold even to presume... the title, for example, takes a lot of risks.

Jerry: In a way, there can be no answers, because all there are are descriptions; the danger is when you reify the descriptions as if they really are answers. My sense of reading this is: let's look at relationships—that's what you should communicate. In terms of what are the relationships of things, as opposed to quantifying them.

Wendel: That is one of the major points made here: relationship between. As much as I agree with your observation, Jerry, the whole of Bateson's work embodies explanation using the notions of description, drawing distinctions, and patterns which connect. These are the explanatory principles he finds most aesthetic and ecological, rejecting so-called extreme fundamental religion and scientific explanation in favor of pattern, context, and ecology. And as you pointed out before, it's difficult to talk about these ideas without reifying them into explanations. Give them a couple of thousand years, and they could be as corrupt-sounding as naive understanding of theological thought and explanation is today.

Douglas: That brings to mind a couple of things in *Angels Fear* that stuck me as new and significant. One was talking about relationship... I got the impression from reading Gregory's previous books that he was dead set against quantity, and quality was the only thing he looked at. Pattern and such became quite a digital thing—in fact, in *Steps to an Ecology of Mind,* I think regarding arguments about the structure of the brain, there were those who talked about it in quantitative terms, and he came down on the side of the qualitative, saying that really what you have are on and off switches and it is pattern we are looking at, but then at the end of the piece, whatever it is, he said that it really is a bit of both, and this is the first time I've seen in working through it that both come together. I loved the notion that the question is quantitative while the answer is qualitative. And I can see that as being quite useful to us as therapists. That we can go in and think of the family as asking a question to which we provide an answer,

and, recursively, that we go in with a question that the family answers—and that it is the movement between the questioning and answering which is what our work is about.

Jerry: I agree. I get that sense, too. I connect it to the notion of reframing in therapy, where you take a quantitative position and you take the family's or family members' statements "as they are," and then change the relationships and move into qualitative differences. Any reality can be superimposed on the original frame... that's moving in a qualitative way from a quantitative situation in the family.

Wendel: On page 49, Gregory talked about when he was trying to play the violin and kept trying to self-correct, consequently messing up the gestalt—the pattern -and he talked about moving to working with calibration as opposed to self-correction. We work with families attempting first-order change or what I see as self-correction, inhibiting or disrupting any sense of calibration that might be possible. Inefficient holism, I think he called it.

Douglas: Insufficient holism.

Wendel: That's right, I like that.

Douglas: What I like about that as applied to therapy is that it is really a response to his disgust for family therapy (and I sense Mary Catherine sticking in a couple of knives as well) construed as (probably more so when Gregory died than now) "we're going to go in and paradox the family." So that it becomes a use of the ideas in a way that destroys the ecology. The way I work and the way I think you work is much less linear, with a recognition that purpose gets in the way of helpfully interacting with families.

Jerry: A sense I had was that a first reading of *Angels Fear* should be as a lesson in humility. In order to be a successful family therapist, you have to be humble, realizing you really don't know what is going on, and you have to appreciate that rather than jumping a logical level to thinking you do know what is going on and that you are making changes and have answers. I think that appreciation can get lost especially if you become successful.

Jerry: Why is Mary Catherine against family therapy? Douglas: Well, Gregory was.

Wendel: Is it family therapy itself, or the issue of power and that ongoing dispute between Gregory and Jay Haley about the danger of that metaphor and the consequences of it? It may not be family therapy in and of itself, but the abuses, distortions, and damage Gregory saw happen in the name of family therapy as a consequence of belief in power on the part of some therapists.

Douglas: Probably also there are very few therapists who really pay attention to what Gregory said...

Wendel: That is part of what this book seems to be about, don't you think? I got that feeling when he was building from the distinctions of Creatura and Pleroma, structure and function—he hit it four or five different ways, but saying the same thing—that he seemed really upset by the ways his ideas were being misapplied.

Douglas: A lot of family therapists continue to operate with the notions that you can count double binds and that therapists must have power over the family, and they think completely in terms of hierarchy. From that perspective, family therapy misses the whole point, misses everything that is being said in *Angels Fear.* If you think in terms of power in relations, you're missing the whole point. All you're talking about is purpose. Apply purpose and that messes up the whole thing.

Wendel: Yes.

Douglas: But I would expect Mary Catherine to be a little bit more open to the possibility of family therapy being true to the ideas and yet still employed, because she, following in her mother's footsteps, is more interested in... I remember that somewhere it was as if she was trying to balance both, or give reverence to the memory of both.

Jerry: Yes, she mentions both.

Wendel: There is a delightful part in the book about the illusory nature of free will—"the tram and the bus." I think Gregory was seriously discussing the power dilemma metaphorically in this part.

Jerry: He seems to be talking about logical types -that no matter what level you're at, living in this world you're going to carry... there is going to be suffering, with some saying "gee, I wish it were better."

Douglas: What I thought he was doing well, what he had done throughout the book and in fact throughout all his stuff, was drawing a distinction and joining both sides. So he wrote in terms of not being able to come down on either side—what you really do is go in a circle with it. It is not simply sitting on a fence, but a movement between, so that when you land on one, you land on the other.

Wendel: With the illusion that you're going somewhere. And he talked some about responsibility generally... And where we start screwing up is when we start punctuating.

Douglas: But even to say that is a distinction that you're drawing.

Jerry: This is where post-modern de-constructivism departs from Bateson, where they would have a criticism of him.

Douglas: Then you never get at the process.

Jerry: Well, Bateson would say that, too; you can never really get to the process—only describe it, which is not the same.

Wendel: In *Angels Fear,* Gregory also said, "We cannot construct something and designate it as sacred."

Douglas: I think that is wise. He is warning people against starting a Batesonian religion. A religion that is made with intent is not going to be sacred.

Wendel: Mary Catherine points out that it becomes a focus of mistrust. I agree with that. Whether or not Gregory is seen as the father of it or not, I see that happening presently.

"The Sacred" in Navajo Religion and Batesonian Holistic Science

By James K. McNeley (18102 County Road G, Cortez, CO 81321). Copyright 1987 by James K. McNeley.

Note: This paper is an adaptation of "Immanent Mind in Navajo Philosophy and Batesonian Science," from the first issue (Spring 1987) of *Dine Be'iina: A Journal of Navajo Life,* published by Navajo Community College, Shiprock, New Mexico, the higher education institution of the Navajo Nation.

There are some interesting commonalities, which I wish to examine here, between the traditional Navajo conception of deity dwelling within and giving unity to the natural world, and the conception of Mind-in-nature proposed by Gregory Bateson. *Angels Fear* examines the similarities between such traditional religions and Bateson's cybernetics-based model of the workings of Creatura (the biological and social realms of the world). Tackling the "epistemology of the sacred," *Angels Fear* addresses the question, "What features of human religions, ancient and modern, become intelligible in the light of cybernetic theory and similar advances in epistemology?" (page 142) Mary Catherine Bateson observes in the Introduction that Gregory had become aware "that the unity of nature he had affirmed in *Mind and Nature* might only be comprehensible through the kind of metaphors familiar from religion; that, in fact, he was approaching that integrative dimension of experience he called the *sacred*." (page 2)

Recursiveness is, of course, a key feature of Bateson's theoretical stance, and we can see such recursiveness at work in his own ideational development, from his early studies of traditional human cultures, through his cybernetics-based understanding of the biosphere, and back to traditional religions with the new understandings gained from the cybernetics model. Bateson must have been that rare anthropologist who not only learned *about*, but also from the subjects of his studies, for it would otherwise seem to be too coincidental that the cybernetic model of the living world which he developed in his later years is one with formal similarity to the systems of belief he found in his earlier anthropological studies. His theory of Creatura has, in fact, been characterized as an "animism no longer anthropomorphic," providing a view of man-in-nature analogous to that found in many traditional cultures, yet in terms which can be acceptable to "post-modern" or "post-Cartesian" thinkers (Berman, 1981, page 141). As with other homologous structures, this similarity suggests a relationship, although I am not well enough versed in his early work to assess the extent to which he learned from his "animistic" teachers.

At a higher level, we *see* a recursiveness in the history of Western thought, from religious-based understandings of the world, through the rationalism of the Cartesian paradigm, and now to Bateson's proposed *rapprochement* between science and religion, with his own theoretical work providing corrective feedback on the excesses and pathologies of religious as well as scientific understandings of the world. We have learned from Bateson and others that, whatever their faults, so-called "pre-modern" philosophies express understandings of the ties existent between human thought and life and that of other actors in the biosphere, and that this essential understanding was temporarily eclipsed with the ascendancy of science. While science and technology have given us much, Bateson and other critics of Western thought observe that we learned our science through studies of the physical world using methods developed by Descartes, Bacon, Galileo, Newton, and other culture heroes, and that we then made the mistake of applying these analytical techniques also to our studies of the biological and social worlds, where they do not fit as well—where, indeed, they have led us to develop a distorted understanding of the human relationship to the natural world, contributing to the environmental degradation, social disruption, and arms races which now threaten our survival. Bateson's later work provides for a corrective adjustment in this loop governing world views, bringing us back to verities taught by his (and our) animistic forefathers. That this should be so should not surprise us, since Bateson had himself shown that self-corrective mental systems are immanent in Creatura, in the physiology of organisms that must correct for variations in such conditions as temperature, in ecosystems where different populations vary in interconnected ways so as to keep the whole in balance *(Angels Fear,* pages 143-144), as well as in the processes of our own thinking.

What understandings do Gregory and Mary Catherine bring from their cybernetic modeling of the living world back to bear upon the subject of religion? In addressing this question, I will use traditional Navajo religion for illustrative purposes, for it is one that I know best, and I think it shares many similarities with other traditional "animistic" religions. It can help to illustrate the view that the cybernetic models of the Batesons, on the one hand, and traditional religions, on the other, are models of the world which both help us to think about the world in much the same way.

Religions are mental models of systems *(Angels Fear,* page 195). Thinking about the world through such models may help in understanding the way the "real" system (whatever that is) works. The Batesons' argument runs something like this: If it is characteristic of religions that they contain ideas which are unquestioned and unquestionable—in short, sacred—the "real" systems they model contain absolute verities, too. If certain religious concepts are not communicated freely, being held "too sacred" to be freely shared, we should consider that the noncommunication of some information is found in the working of all living systems, and that this may be necessary for sustaining the integrity of the whole (pages 80-81 and 135). If religions require a leap of faith, there are similar gaps in our perception of the world where, indeed, faith is required for the continued existence of our being, and religion helps to protect that faith

(pages 95-96). If religion attempts to unify experience, providing in fact a "pattern which connects" the elements of experience, then there is, in the cybernetic understanding of the world, a unity and a communicative web which is not discerned by classical science (page 196). If religions characteristically imply an ethics and an aesthetic, then there is (in the Batesons' theory of Creatura) an implied injunction not to violate the communicative web, and there is aesthetic satisfaction in holistic perception and recognition of system integration (page 199). There exists, in sum, formal similarity between the structure of Batesonian holistic science and the structure of traditional religions. They are both "good to think with (in some respects), and they both help us to think about the world in much the same way.

If this be so, how "good" is, for example, Navajo religion to think with, if we use the Batesons' holistic model of the world as a sort of standard? Would it seem to serve the Navajo people well in understanding the world the way "post-Cartesians" understand it?

The complex Navajo creation myth, which is the basis for Navajo religion, describes a world in which its human inhabitants are given life, guidance, and instruction by the holy beings who are conceived to reside within natural phenomena in the four directions. All elements of the natural world are conceived to be animated by indwelling holy spirits, and to be given life and the capacity for thought and action by the powers of the Wind Spirit which animates everything. Thus the earth, the sky, the stars, the moon, the mountains marking the Navajo lands, the waters, the animals, the plants, and the people of this world are all attributed with the capacity for thought and communication with one another via the all-pervading Wind Spirit, which is the common medium for thought (McNeley, 1981).

But there is more involved in this world view than simple animism. The Navajo world is one in which, throughout mythological times, its inhabitants have become progressively able to establish connections with different aspects of the supernatural—with different holy people residing within the various phenomena of nature. The goal of life is to live in a condition of balance and harmony with the powers and other inhabitants of the world. This is not easy! It requires following prescriptive teachings, correcting errors through ritual means, and always recognizing that one is a part of a communicative fabric which unites all elements of the living world. To arrive at the ideal condition of harmony, to arrive at the good, to arrive at the beautiful is to achieve identification with an abstract and enigmatic being referred to as *sa'ah anagram bik'eh hozho*. But this being is not a localized god or power, rather it in itself symbolizes a state of balance between the great male and female principles which underlie and give life to the entire world which w as created on earth's surface. The seeking for identification expressed in the prayer, "I am sa'ah anagram bik'eh hozho..." is nothing less than an identification with the whole system in a state of harmony and balance.

In looking for similarities between this Navajo construction of the world and that of the Batesons, we first find an illustration of Gregory Bateson's claim that religion consists of "vast aggregates of organization having immanent mental characteristics" (*Angels Fear,* page 142)—much as does his own cybernetic model of the world. Additionally, the Navajo ideal of harmony is conceived to be achieved through, in essence, reopening channels of communication to those holy ones who have it within their power to reestablish balance and remove pathology -very analogous to the self-corrective circuitry found in Holistic Science. Other features of Navajo and of Batesonian views about thought and mind become evident in a comparison of the two; I see these commonalities:

Both hold that thought or mind is immanent in nature. Both hold that human mind and thought is not equal to—let alone superior to—that which exists elsewhere; the greater intelligence lies in nature. Both hold that there is a flow of ideas, of messages, throughout the world, and that this flow of information is critical to the maintenance of balance or homeostasis—and they even agree that such a balanced unity may have the aesthetic quality of beauty (Bateson, 1979, page 19).

Both hold that, in the interactions between human and non-human thought, distortions in human thinking may lead to disruptions in the larger world, and that human thinking must be corrected if balance, harmony, or homeostasis is to be reestablished in the world.

In the most general terms, I think that the most significant bridge between the two views is a common recognition that human life and thought are contingent upon the thought relationships established with other elements of the natural world—elements which are more pregnant with knowledge than is the limited mind of man or woman.

There are critical differences, to be sure, between the two models. Batesonian theory defines the locus of thought as being in systems—in the arrangements and behavior of phenomena—rather than in minds dwelling within matter (Berman, 1981, pages 115 and 236). Secondly, Bateson held that human thought is distinguished by its conscious character, while Navajo philosophy holds that the difference between human thought and the thought of the holy people is in the extent of knowledge of the holy ones. Thirdly, Bateson conceived of a Mind-in-nature which governs an evolving world, while the Navajo view is of an essentially established, closed world.

Despite the differences, I believe that in Bateson's later days he would have felt as comfortable in the company of Navajo medicine men as he did in the midst of the counterculture at Esalen. Here, he would have found others much like himself attempting to model in their own thoughts the integration and complexity of the natural world.

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Some Thoughts on Interpenetration: A Response to *Angels Fear*

By George F. Cairns, Jr. (1504 West Norwood St., Chicago, IL 60660). Copyright 1987 by George F. Cairns, Jr.

I will comment on a few epistemological points developed in *Angels Fear* (particularly in regards to the notion of interpenetration) and then I'll address the rest of my remarks to some implications for the development of a more explicit technology for accessing the sacred—a personal and corporate practice technology.

I find the reconstructing of the world using Jung's Creatura/Pleroma to be extremely helpful. When living beings are defined as systems that incorporate broadly construed notions of mental process, it becomes increasingly difficult to maintain the mechanistic world view held by many of my behavioral science colleagues. What is posed instead is a much richer and more flexible world than the usual dualistic (and often rigid) world view suggested by mind/body conceptualizations.

There are profound implications for our world view when the permeability of the boundaries of Creatura is enhanced by the notion of functional interfaces (where different aggregates of systems processing information supplant our usual notions of a unitary bounded system, such as a human being's skin). This view of Creatura as an extremely flexible and richly interconnected system also provides many implications for our understanding of the sacred. In particular, I believe that it is a crucial insight to realize that the functional systems descriptions of Creatura provide infinite overlays of aggregates of living beings and non-living systems into higher-order systems.

This boundary permeability of Creature may approximate the notions of interpenetration as described as a core mystical experience of many of the world's religious traditions (I think particularly here of the world as exquisitely described in Hue-yen Buddhist thought). This radical interpenetration, where nothing exists totally (or at all) separate from anything else, is perhaps the highest-order logical type. The world view posited in *Angels Fear* provides us with an algorithm (examination of the relationships of logical types) to co-evolve a more explicable sense of the sacred. A major purpose of religious spiritual practice disciplines is to develop flexible ways of defining, recombining and collapsing our parentheses that, in the end, only act as conveniences to temporarily define system or logical type boundaries.

I agree that the development of a more explicit epistemology along with suggestions for explicit disciplines is fraught with hubris. The paradoxical nature of making more accessible that which is defined, at least in part, by its inaccessibility will almost certainly have profound unforeseen consequences. I wonder if the process for integrating each new understanding within the context of one or more of the metaphorical systems that we label as our religious traditions might reduce the risk of accessing new information too rapidly—might the viscous nature of these systems be one of their primary virtues?

I believe that the apparently paradoxical limits to understanding posed by a radically interpenetrating world can be resolved when we shift our mode of process from analytic thought to spiritual practice. I believe that one major function of liberal religions is to extend our understandings of what it is to be a human being by participating in different sacred practices, and then to examine these practices analytically in an effort to further extend our human understandings. I would like to use as a working definition of sacred practice: Those procedures that allow individuals and groups of individuals to more fully communicate with larger-than-individual human systems. I believe that the work in *Angels Fear* points toward many ways of knowing—and that the realms of understanding of the mystic may be accessible not through analytic understandings, but rather through direct experience of unitary relationship. The work in *Angels* Fear in this respect may then act like the finger pointing at the moon, but the analytic understandings gained from studying it cannot substitute for engaging in sacred practice.

I have written elsewhere about one conceptualization of how some primal people may deeply access the communications of ecosystems through their spiritual practices (Cairns, 1987). What I would like to do here is to sketch, using some cybernetic notions, how a specific spiritual practice may approach the sacred more deeply within liberal Western protestant traditions. I believe that the process of incorporating evolving spiritual practices is a major if not the major function of a congregation. The model for a sacred practice that I'll use is harmonic overtone chanting.

Harmonic overtone chanting is a general descriptor that defines a cluster of practices having as their common element the production by an individual chanter of multiple simultaneous tones. When an individual chants, the overtones are produced by amplifying much that is already there in the person's voice. I believe that there are examples of this practice within many of the worlds religious traditions—although in some cases, such as Christianity, the practices have largely been forgotten. The practice continues in others, such as the Tibetan tradition as practiced in the Guyton and Gymea colleges, and in the Home singing in Mongolia.

There are several reasons why I believe this practice to be particularly helpful. First, sound meditation appears to be more accessible than other meditation strategies to people I have worked with. Since one purpose of my work is to engage as many people as possible in spiritual practice, an initially accessible practice is desirable. I do have concerns about the effects of a more complete sharing of previously inaccessible information by more broadly enabling people to access this experience. That is why I am concerned about grounding the experiential understandings in a

religious tradition. As mentioned above, this constantly looping back into tradition may provide some check on a positive feedback loop that would produce a pathological development.

Second, the phenomenological experience of sounds being produced by an individual chanter that appear out there" rather than inside and the experience within a group of chanters of sounds being produced that are not only "out there" but also which are perceived as not being produced by any individual is the most direct experience of interpenetration (in this case of sound) that I have ever had. There are rich metaphorical communications contained in this practice. In describing the Tibetan practice, Houston Smith pointed out that "Overtones awaken numinous feelings because, sensed without being explicitly heard, they parallel in man's hearing the relation in which the sacred stands to his life. The object of the lama's quest is to amplify life's overtones" (Smith, Stevens, and Tomlinson, 1967). As Jill Perce (a western teacher of chant) has said, the fact that these overtones do not usually carry information that is practically useful to us in everyday life results in our tuning them out (Puree, 1986). This provides an interesting example of our attenuating the sacred by reducing the always present information from the world. I would add that my experience that all is sound that occasionally arises while engaging in this practice may act as a metaphor for the experience of the oneness that is sometimes called kentia or satire.

Third, these practices do have a grounding in different spiritual traditions, such that previously developed understandings provide an established and elaborated matrix for practitioners to express their experiential understandings. While there are no guarantees that destructive individual or cultural patterns might not develop by looping back to spiritual traditions, this likelihood may be reduced.

My hope is that my attempt to describe the development of a new (or more accurately, forgotten) practice technology may provide you with another way to hear about the sacred. I believe that developing and engaging in practice methods that then are incorporated into existing religious traditions using systems/cybernetic notions may be an effective way for us to continue to co-evolve a religious technology that is neither supernatural nor mechanical.

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Some Comments on *Angels Fear*

By Joan Arnold (2623 N. Winsted, Tucson, AZ 85716). Copyright 1987 by Joan Arnold.

Gregory Bateson to me is one of those seminal thinkers who speaks about a variety of subjects from a holistic perspective. I looked forward to digging into this book, with its hints about an "epistemology of the sacred." Epistemology is defined on page 9 of *Angels Fear* as "the structures of knowing and the pathways of computation," while faith in the natural sense is our belief in the validity of the images we form of those things we relate to. Here Bateson seems to be espousing a correspondence theory of truth—the idea that our images "correspond" (or we believe they do) to the reality. (Cf. page 96.) Now in all this, I still have the sense of the rational mind at work, and no sense of the experience of the sacred. In fact the epistemology outlined above would indicate that any "experience" of anything, including the sacred, is illusory.

Bateson then examines the category of aesthetic understanding, using metaphor and story. He gives two examples:

1. *The Native American Church*. Here the issue was the offer to have the religious ceremony photographed, so that the bureaucratic powers could understand the religious nature of the ceremony and would permit the use of peyote, which would ensure the survival of the Church. The Native Americans rejected the photography, even though insisting on their religious integrity might have meant the destruction of their religion.

2. *The Ancient Mariner*. Here Bateson goes deeper and points out the transforming in this poem, when the mariner "blesses them unawares." The key is indeed the blessing unaware, and he points out, correctly, that any kind of conscious blessing won't do the trick.

What is the quality of this "unaware"? It obviously isn't sleep, or the businessman so involved with his business that he is unaware of any other dimension. The mystics spoke of it as a kind of "unknowing," and some Buddhists describe it as "emptiness." As one reads the mystical literature, what one gets is a sense of falling in love, of commitment no matter what, a journey—and a finding in the paradox of unknowing/wisdom, or emptiness/love. It is as if the person begins a quest for a new dimension of seeing (cf. the tradition of the third eye), or, sometimes, as if the veil of the everyday is torn apart, when the person sees in a blinding flash for a moment, and the quest begins.

Perhaps the best way of studying this reality is the way Abraham Maslow studied "successful" people, the people he felt were self-actualized, to see what common elements they might share with each other. The Neuron-Linguistic Programming people did the same thing with therapists—they studied Virginia Satir and Milton Erickson to discover why they were so extraordinarily successful in their therapeutic work. We need many more data than we presently have on ways of knowing the sacred. Only when we have the data can we begin to come up with some kind of taxonomy of the sacred, some description of ways of knowing.

Bateson points out that our dichotomy between knowing and feeling gets in the way of this knowledge. What does it look like if we integrate feeling into our knowing? Good scientists are very aware of their passion for knowing, their passion for their corner of the universe. When does that passion open up our knowing—and when does it betray it?

The language of religious experience is different from conceptual language in a very fundamental way. Conceptual language intends to function as a map of the world. We become confused when we think that conceptual language is the reality, though in fact many people do make this mistake. The language of belief systems seems to function the same way. It has been pointed out that contemporary fundamentalism has more in common with a post-literate and scientific mentality than with the ancient biblical mentality, in its claim to factual exactness.

The mystics speak of religious language in a different sense—that language is no longer a *map*, but rather a finger pointing at the moon. The finger has no recognizable similarity to the moon. The relationship is one of direction and purpose—it shows where to look. It is no accident that Zen makes use of paradoxical "khans" or conundrums, like "What is the sound of one hand clapping?" Mantras (repeated sounds, words, or phrases) give the rational mind something to do, while deeper levels of the mind are then open to experience.

As I began studying systems and reflecting on holarchical levels from cell to organism to family to community to society to planet to solar system to galaxy to universe, I became aware of Universe as God—that what we name God is in fact a higher level of whole, of which we are a part. The epistemological relevance is that in knowing the Universe, we know it by being in relation, by being a part of it, not as some disinterested observer different from and opposite to it. We know by participation, by sharing, and by likeness—cf. the ancient idea of the human as microcosm. This way of knowing has been touched upon by Martin Buber

and Teilhard de Chardin, both mystics. I suggest that it merits further exploration.

Perhaps this is the real contribution of Gregory Bateson: the development of a language and a perspective allowing us to look at our world differently. His comment that in ordinary language we speak about the *things* of our world, while dolphins appear to communicate *relationship*, is something that I have been hanging out with for several months now. This relationship-perspective is crucial to the epistemology of the sacred. Like Moses, Bateson seems to have had a glimpse of the Promised Land that he did not enter.

A Conversation Piece

By Mike Preston (634 N. 6th, #1, Lafayette, IN 47901). Copyright 1987 by Mike Preston.

Then, as if it can be said of the living, the set is struck in utterance, and the next performance is presaged in the construction of a unique similarity. The tent goes up, and hay bales are broken in perhaps the same field in which they were formed but a year ago. At that time I am protégé to a prescient personator. Made up to mind, the orders in the color of my face, like to avoid the careless eye. My mentor has given me instructions in method; I have read books. I find it difficult thought: to form description from what is immanent in a society of private properties. The older professionals bring the younger and pre-professionals to the show. The old ones have brought the young ones to feed on the kernels of knowledge in what little marvels are performed. My mentor is drunk on the mash of these kernels, but the crowd knows that he is a superior clown.

My routines are neatly specified. My task is to make them laugh, and while they are laughing I am to persuade them of the self-evident value in the belief that I have made them laugh. But I'm the routine of routines. Or am I? I pose this question to my mentor:

STUDENT: Why do all the clowns in this circus have red noses?
MENTOR: Because they are necessary features of the faces of the clowns in this circus.
STUDENT: Why are they necessary?
MENTOR: Because all true clowns have them.
STUDENT: What do you mean by "true clowns"?
MENTOR: It would please you to know what a true clown is, but knowledge is something which I cannot have.
STUDENT: But how then can we talk about "true clowns"?
MENTOR: It seems that we can't, so let's change the subject.
STUDENT: I strongly object to this evasion of my question. It is crucial to my career development that I know why the clowns in this circus have red noses.
MENTOR: So it is.
STUDENT: So what is? What is it? Why can't I get a straight answer out of you? Just tell me... This conversation is absurd!
MENTOR: Whoa! Hey, cool down. Nobody said clowning was going to be a picnic. Anyway, you're the one who ran away and joined the circus.
STUDENT: Yeah, you're right. But I've just got to find out why.
MENTOR: Well, that could take forever, especially if you intend to use words. To quote the great Pierrot:

Pardon Pierrot for speaking, please. Most of the time
I play my part only through grimace and mime.
I silently move like a phantom in white,
Always fooled, always beaten, and trembling
     with fright,
Through all the embroglios traced out in bold
Brush-strokes by the Comedy dreamed up of old.
Comedia dell' arte was once this art's name,
Where actors embroidered their role as it came. (1)

(1) From the Harlequinade *Pierrot Posthume,* by T. Gautier and P. Siruadin (first performed on October 4, 1847), as quoted in Jacques Derrida's "The Double Session," in *Dissemination,* translated by Barbara Johnson, University of Chicago Press, Chicago, 1981, pp. 203-205.

Where Angels Fear. They Dare

By Lawrence A. Waldman (1804 Shirley NE, Albuquerque, NM 87112). Copyright 1987 by Lawrence A. Waldman.

Note: In this response, I also draw from some letters of Gregory Bateson to Philip Wylie and Warren McCulloch, published in "They Threw God Out of the Garden", The *Coevolution Quarterly* (36), Winter 1982, 62-67.

The Batesons have written a powerful book, no doubt about it. Gregory is his usual self—probing, rigorous, enigmatic. Mary Catherine adds a lightness that is at once explanatory, insightful, and unifying. Together they take a romp through the Uncharted.

Gregory is interested in ways of knowing the sacred and the aesthetic, and learning how to know what is consciousness, wisdom, and love. Biological life processes information in circular and more complex loops, and thus exhibits characteristics of mind. Biological life also tends to be organized hierarchically, with mental characteristics and consciousness possible and likely at many different (logical type) levels, including levels higher than that of individual human consciousness. What might these other minds be like? Self aware? Able to communicate with humans? Indeed, says Gregory, such higher level minds may even be what we have called God. And communication may already be happening, in those parts of our minds to which we do not have direct access.

These kinds of communication are attempts by the larger cybernetic system to correct for local non-cybernetic, non-systemic thinking and acts of conscious purpose. How many levels of systems could be involved is open. Do planets communicate? Do solar systems? Galaxies? If they do, it would happen much too slowly for us to have noticed. Could there then be a System of All Systems (SOAS)? If so, the mind of SOAS would be God, and the structure of SOAS would be "God's will." "Sin" would be the act of ignoring systemic requirements in favor of conscious planned purpose at some lower logical type level. The possibilities are endless, and my mind boggles.

Gregory offers us an epistemology capable of providing a unifying structure for integrating most of the world's religions. To a large degree it is capable of explaining much the same things that religion explains, but in such a way as to offer new insight without rejecting the old. It is an approach both scientific and rigorous. It is no competitor but a complement. No doubt most adherents of most religions would not consider Gregory's offering a religion of any sort, given that it has no supernatural component. But the potential is there. And who knows, communication with higher level mind may require such as faith and empathy, so there may be more convergence when more is understood. But whatever lies ahead, we have right now the opening of a way to approach with rigor what has heretofore been unapproachable from that direction. It is a very exciting prospect.

Critique of *Angels Fear*

By Laurence J. Victor (Pima Community College, P.O. Box 5027, Tucson, AZ 85703). Copyright 1987 by Laurence J. Victor.

I approached *Angels Fear* with a great deal of excitement. Gregory Bateson has long been on my list of top ten minds of the century, and although I had come to some of the ideas he had independently, there were many ideas that he taught me, and I was impressed by both the scope of his thinking and his ability to move people to thinking anew. I have long regretted not having known him personally.

So my disappointment with *Angels Fear* was deeply felt, but there was also a very personal lesson in this "failure" that I must take to heart for my attempts in sharing my own complex vision with others. I had to force myself to continue reading, which is the response I get from most others to my own writing. What we are trying to communicate is very difficult, if not impossible, to communicate. All of what follows is what my mind/brain created from reading *Angels Fear;* after a careful rereading, or after having my misperceptions pointed out, I may change some of these interpretations.

Gregory has a system of visions of how the nature of mind and knowledge are changing, new perspectives and paradigms that he wants to communicate, and finds so difficult to communicate. Yet he is adamant that they can be shared by "communication," that all the message can be captured within the symbols of language. On page 5, in his poem "The Manuscript," he says:

> And if you read between the lines
> You will find nothing there.

To me, everything is between the lines—that is, what I experience in my mind after decoding the message. And, that which was the context of Gregory's thinking while he emitted sentences. I am also an advocate of precision, but so that what is experienced will have clarity. I have difficulty comprehending how Gregory hangs on to old concepts of communication while at the same time creating the foundation for transcending these very concepts. But this, too, is one of the mysteries of creative minds.

> Gregory and Albert,
> both on the cutting edge,
> both standing on the shoulders of giants,
> both creating catalysts for new realities
> which they themselves could not accept.

> Gregory and Albert,
> both solidly grounded
> in the very paradigms
> that they helped overthrow.

> Einstein couldn't give up
> classical clockwork determinism
> and couldn't accept probability
> as a fundamental component of reality.

> Bateson couldn't give up mechanism,
> and remained locked into first order cybernetics,
> control theory, and adaptive evolution.
> Stability remaining primary over (emergent) evolution.

I found enlightening the strong emotion in Gregory's attack on the Cartesian and Lamarckian perspectives, which to me indicates that the person still harbors within himself part of what he fights.

I personally find a strong Cartesian dualism remaining with the concepts of Pleroma and Creatura. I myself work within a two-reality model: the domain of matter-energy and the domain of symbolism, which correspond rather closely with Gregory's Pleroma and Creatura. However, I see this as a temporary crutch, but also possibly necessary; that the "nature of reality" "is" "something" quite different. I am not sure that "dualistic thinking" and "object perception" (with "thing" as primitive figure-to-ground, a necessary consequence of our long-term-memory classification/access system) are not wired in. I view humanity as an embryo, and will refrain from claiming what the "mature" form will be, and thus to me, all claims of truth must be taken from this perspective. If there are Eternal Verities, we humans are not in a position to discover them.

I agree with Gregory on this sense of the "sacred" -that which is beyond our grasp and remains in mystery—but according to our real position as holon within an immense evolving cosmos. I agree that any viable system must filter its input, be it matter,

energy, or information; but I don't accept Gregory's proposition that certain information from the larger macro-system or holarchy must be kept from us. It may be that we are not prepared for it at this time, or not competent to process it, but a divine conspiracy to keep us in the dark for our own good doesn't sit well with me. Nor do I want to view the "sacred" as "forbidden fruit." But I also feel there is much about the whole... Holistic... WHOLE that human mind/brains (even collectively facilitated by computers) can never, ever comprehend. I agree that many metaphors can be used to assist us in thinking on matters where linear logic fails, but I don't want to give "religion" any monopoly on these metaphors. (At age 5, I inferred from the discovery that there is no Santa Claus that there may be no God.)

Gregory appears to accept as final many contemporary theories of Pleroma. He seems to accept physics and chemistry as relatively finished, as well as much of biology. He rejects any possibility of matter-energy interaction beyond the four known forces (no interactions between mind/bodies without matter/energy exchange). He accepts DNA as the only source of our inheritance, when there is as yet no evidence that the positive structures of our multicellular morphogenesis are the products of chromosomal information.

Modern science has pushed many critical issues under the rug and has claimed final expertise, as science *always* has done. Gregory has seen through much of this, but he has also been seduced to accept some of it—as *all* of us have.

Gregory creates a straw man for Lamarckian influences. He claims that if it were a primary force in evolution, it would destroy stability for survival. I agree. But it could be one of many forces behind the rapid emergence of new levels. I have been working on a model, called "feedpast": when "minds" of systems are able to simulate themselves and alternatives within themselves, they can resonate with their own pasts (literally) and influence their own evolution. This involves information (not matter or energy) being "received" in the physical past. A faster-than-light complementary universe could facilitate this. In this way, organisms with higher level minds can "bootstrap-by-vision" their own evolution—the human species now may be influencing our emergence from our primate ancestry (which may account for the absence of our difference from chimps being found within our chromosomes); and some of us, as "adults," may be influencing our own embryonic and childhood developments. This involves a concept of two-dimensional time—and a shift of our fundamental existence from a physical now to being extensive-in-time. This radical speculation does not contradict the epistemology of modern science, only some of the dogmatic structures imposed by the contemporary scientific priesthood.

My copy of *Angels Fear* is marked up on every page with questions that I would like to ask Gregory—no, with issues that I would like to discuss with him; the question/answer mode is insufficient. And this is our problem: I firmly believe that the ideas Gregory (and many of us) wants to share *cannot be communicated*, and that we must seek methods *beyond communication* to share new paradigms, perspectives, or complex conceptual schemes. The passively read text is grossly inadequate, even with simulated metalogues so well done by Mary Catherine. The book in one sense accepts this premise, both in its format (of letting us experience Gregory's thinking process), and in proposing metaphorical interaction on the sacred—all pointing to the need to go beyond communication. And yet, Gregory argues strongly for the sufficiency of contemporary communication and feels he is communicating.

By "communication," I mean the complex process by which messages (as space-time patterns of matter/energy) are encoded, transmitted, and decoded. Encoding and decoding can involve complex stages of pattern recognition and information processing. What goes on after the last stage of decoding (a received message) and before the first stage of encoding (a response)? Contemporary communication theory simply splices the two

together and assumes a mind/brain is nothing but an information processing system. Decoding and encoding are influenced by the present structure of the system (memory or context) and by ongoing processes within the system (thinking); this structure can be altered by the information itself (learning).

Communication theory is silent about how context is created or how memory is organized. In particular, how can an alternative organization of knowledge (knowledge structure or context) be shared? This requires that we go "beyond communication," as the process of decoding filters and distorts input information to *always* fit pre-existing context. Minor accommodations of context only occur when a subsystem of context is not yet fully formed.

In "closed primitive" communities, context developed in an individual during enculturation/socialization at the same time the language and perceptual systems matured. Only in "modern times" are we faced with the necessity of significantly changing context within one lifetime, and the traditional means of enculturation, socialization, and communication are inadequate.

Comprehension of communication requires shared context between sender and receiver. "Understanding," to be distinguished sharply from "comprehension" (my redefinition), relates to the subjective feeling of closure within the gestalt of the receiver. That is, "understanding" is experienced when there is a fit between the processed statement and the context. This usually comes whether or not the statement is comprehended "correctly," but as a result of the natural distortion and elaboration on the statement during processing so as to insure a fit. Comprehension, on the other hand, relates to the degree of "structural" fit between two contexts, specifically related to a system of mutually exchanged messages. Thus, I feel I "understand" most of what I read in *Angels Fear*, but I am not confident that I "comprehend" it as Bateson intended.

Contemporary scientific discourse is strongly dependent on consensus of context. Scientific articles carefully establish this context by references to the literature, and usually introduce only a few new ideas designed to fit this context.

New contexts cannot be communicated within old contexts. Contexts are mental constructions. A long chain of statements emitted while thinking within a context (as in writing a book) represents the context only to those who already possess the context. Each statement received is processed (immediately) in terms of the pre-existing context of the receiver, and is always distorted to fit. It is impossible to (passively) play devil's advocate (believing all the statements until you get them all and see how they fit together, and then evaluating the whole) for a context you don't already possess, even if you want to. On the other hand, when authors re-read their writings, it is always experienced within the context from which it came, and it is difficult, if not impossible, for an author to experience the text "raw" within a different context.

Complex conceptual schemes can be constructed through an indoctrinational form of education, creating context where there was none before. This is most evident in textbook education in the sciences at universities.

However, alternative contexts can be learned, but not according to behaviorist theories of learning through reinforced responses to input. The learning of contexts does require interaction between a learner and his or her knowledge environments. We have yet to discover the patterns of this more advanced form of learning, but we will not do so until research accepts that it is not just a more complex form of learning within contexts; and this calls for major changes in our educational systems and practices.

I look forward to the new networked hypermedia being developed for computer-mediated personal interaction to provide tools for the creation of learning environments for the sharing of new and alternative contexts. I would like to put *Angels Fear* on Apple's new "HyperCard" and initiate a new style of discussion around the many paradoxical issues that the book raises.

With Love and Trepidation

From Burl Grey (Papillote Ltd., Wilderness Retreat, P.O. Box 67, DOMINICA, WINDWARD ISLANDS). Copyright 1987 by Burl Grey.

Thanks much for the invitation to comment on *Angels Fear.* I do agree that the "drift" of CC leaves something to be desired—some of which is well stated by Larry Richards in CC #9. Larry refers to "... differing uses of... words as imbedded in certain ways of thinking, and those ways of thinking need to be made explicit and themselves discussed." He refers to the words "society" and "utopia," but I am very concerned about words like "Pleroma," "Creatura," "epistemology," and "ontology."

In *Angels Fear* (page 19), I was jolted by Mary Catherine Bateson's bracketed "... there can be no clear line between epistemology and ontology." Back on page 18, she denies a dualism between Creatura and Pleroma, but I get the distinct "flavor" of that (real world—out there) which is of course a kind of nonsense which many are at great pains to deny, but which is belied by their language. I offer an unambiguous example from CC #9 (page 5), where Michael Yocum quotes Humberto Maturana on autopoiesis and in the next paragraph uses language that Maturana expressly forbids as nonsense: "... some differences out there in the universe..." On the same page, Yocum paraphrases Bateson as insisting that "all he could ever know were *his own* perceptions," so there is for me a lack of clarity in this descriptive domain—and if Bateson was concerned with anything, it was *clarity.*

In *Angels Fear* on page 20, Gregory Bateson says "So I will define Epistemology as the science that studies the process of knowing..." and then he messes it up for me by referring to "... the material world..." I believe Bateson died before he had fully integrated (or perhaps understood) the contributions flowing from *Laws of Form,* autopoiesis, and cybernetics of cybernetics. "Perhaps out of G. Spencer-Brown's *Laws of Form...* deep restructuring of... epistemology may come." *(Mind and Nature,* page 91 of the Dutton edition, page 101 of the Bantam edition.) This quote shows that he was aware of the possible relevance of this material.

I found at two conferences on cybernetics the kind of schism between what I now call the Epistemologists and the Ontologists, and I go with the former, who are concerned (as Bateson above) with the process of knowing, and have no need for a reality out there (which Bateson never really gave up completely).

I feel that while Mary Catherine Bateson made a valiant, intelligent, and interesting effort, the goal (towards an epistemology of the sacred) is too subtle and elusive, given the clear controversy over crucial issues. I quote from a paper by Klaus Krippendorff entitled "An Epistemological Foundation for Communication" (*Journal of Communications,* Summer 1984, page 22): "The application of cybernetics onto itself is producing a shift in the paradigm of scientific inquiry from ontology to epistemology and is likely to reorient our thinking about communication in fundamental ways."

In April of 1980, at Esalen, I asked Gregory Bateson whom he corresponded with the most, and he quickly answered Roy Rappaport, who I feel addressed the epistemology of the sacred in his *Ecology, Meaning, and Religion* in language which avoids the confusions in *Angels* Fear.

Bateson's Cybernetics of Liberation and the Bureaucracy of the Sacred

By Dan White (1801 East Lake Rd., #12-G, Palm Harbor, FL 34685). Copyright 1987 by Dan White.

The recent debate in *Continuing the Conversation* regarding control cybernetics raises fundamental issues in the philosophy of science; it furthermore suggests the broader problem of the relation of the sciences to the humanities. My argument is as follows. The para-digm of control cybernetics is of such broad explanatory power that it can produce models which are analogous in structure and function to a host of biological, sociological, and psychological phenomena; indeed it would seem to provide for the comprehension of all "systems" studied in the life and social sciences. But there are serious questions regarding the application of these models to living systems, specifically regarding the ideas of mind and purpose projected by the models. The very explanatory power of the paradigm, moreover, poses a risk to cyberneticians, for as their science becomes entrenched as a new and all-pervasive paradigm, it runs the risk of becoming not the conceptual miracle of a charismatic new movement, but rather the dogma of a new orthodoxy. Since the orthodoxy, moreover, purports to be "scientific" and respectable, rather than the emblem of some radical theoretical fringe, it must adapt to the precepts laid down by traditional science. These precepts are, for better or worse, Cartesian: they require that science be the rigorous mathematical/logical assimilation of phenomena into a methodological framework. Within science, this framework includes ideas of quantity (what Descartes called primary qualities) or, if cybernetics is successful, symbolic logic and Boolean algebra; it excludes ideas of quality (what Descartes called secondary qualities): emotion, aesthetic contemplation, and imagination. If this is indeed what control cyberneticians, in their zeal to be accepted as good scientists, are doing, they may well, given the technological and egoistical impetus of our culture, turn their potentially liberating new ideas into the bureaucratese of a Brave New World.

The notion of control cybernetics is fairly well understood, for it deals specifically with the programmable functions of stochastic machines: the air conditioner thermostat is set at 78 degrees and activates a cooling mechanism if the air temperature deviates above that figure; the automatic pilot of an aircraft makes adjustments in the plane's steering system in order to correct deviations from the programmed flight path; the defense systems of the still (one hopes, permanently) imaginary Star Wars project "perceive" their targets (incoming ICBMs), extrapolate their courses, and fire their beams to hit the missiles at an anticipated point in space and moment in time.

It is therefore largely by analogy with cybernetic control systems that natural, particularly biological, systems have been understood: the human body, like the thermostat, maintains a set temperature of 98.6 degrees Fahrenheit; if the body temperature rises above this point, perspiration will normally occur to cool the system down; if the temperature descends below the point, shivering might set in to warm the body up; either way, the goal is maintained. If it is not, then ill health results. Likewise, an animal population is maintained at a certain level appropriate for survival by a combination of factors. For instance, deviations above the norm might be corrected by predation: wolves prune the caribou herd. Deviations below it might be normalized by expanded food supply due to undergrazing: increased food supply allows support of more animals. If the predators don't do their job, then the upper limit of the population might also be controlled by food supply, but this might lead to overgrazing, destruction of the food source, and starvation for the herd. The analogy with control systems seems to be fruitful in these kinds of examples, for the behavior of the systems involved is apparently predictable on cybernetic principle: the maintenance of a steady-state, a goal which is the normal bias of the system. A human being sets the thermostat of the home air conditioner. But how are the "programs" that determine the bias of natural systems set?

The answer must be in terms of evolution: the appropriate temperature for the human body has been determined by infinitesimal changes in the genome, which in turn have effected phenotypical variations, which have been edited by the environment into the functional whole—including the proper temperature setting—of the human organism; similarly, the population level of the caribou herd has been set by the constraints of its en-

vironment, which is itself evolving in response to the population. (Of course the population level is fixed at a different logical type in the organism-environment system than is body temperature, and indeed the organism itself may be seen as having a variety of responses which are of higher or lower logical types and are, correspondingly, "hard" or "soft" programmed. (1))

But if evolution sets the bias of natural systems, indeed designs goal-seeking systems, is it too purposive? Or, to rephrase the question in simplistic and dramatic terms, is evolution a "what" or a "who"? If it is a "what" then presumably it is material: a thing or process. But how is it that a thing or process comes to behave purposively? Here a consistent materialist might argue that nature does not really behave purposively at all: human beings perceive and explain in terms of purpose, and so attribute it to nature and even to themselves. In the case of nature, they are simply doing what we have done above: drawing an analogy—and analogies are useful but are not identical with what they explain: the map is not the territory. The human craftsman purposes to make a table. He therefore draws a design and then shapes some material, say wood, into a more or less perfect facsimile of his design. Idealist philosophers like Plato argue, analogously, that objects in the natural world have been formed by a divine craftsman working from perfect mathematical models—Ideas -with the imperfect materials of nature to shape objects, each with an appropriate purpose. (2) Aristotle, probably the first cybernetician, took that purpose, in the case of organisms as opposed to artifacts, to be self-maintenance. (3) In any case, this, in the view of critics, is simply a projection of human consciousness and creativity onto natural processes. The materialist might say, following Galileo and Descartes, that human purposiveness is subjective or a secondary quality of human existence; it is not objective and so has no real existence, i.e., no being independent of our minds. Only measurable quantities are primary qualities and have separate existence. But if this is so, then the whole explanation of the natural and human world in terms of "purposive" control-cybernetic systems is pure fantasy—intricate operational fantasy, perhaps, but imaginary projection nevertheless. Not only is the idea that evolution is purposive not necessitated by the argument that natural systems are, but also the whole notion that natural systems are purposive is suspect. (4)

Cybernetic explanation appears suspect because purposes are definable only in terms of *final* causes (even if they are only specified negatively by means of error correction) which are not efficient or material but *ideal*; this means, of course, that purposes are conceived in terms of ideas, whether these are thought to be objective or subjective. But ideas are the objects of thought, which in turn means that they are the objects of thought for some mind. (Or, in the language of cybernetic discourse, ideas must exist in some mental circuit.) If ideas are objective, existing independent of our minds, then they must be the thoughts of some larger mind: this is what Bateson took to be the Mind of the biosphere and the minds of its component systems, ourselves included. If ideas are subjective, their existence dependent on our minds, then they are merely the objects of our thoughts, and so the purposive description of natural systems is simply projection. If the control cybernetician objects that nature does exhibit a larger mind, then he or she is committed to the view that the evolving biosphere is in some sense a Who. God has returned via cybernetics, as Bateson clearly thought, now conceived as immanent in nature. But how does the cybernetic theorist know this? Has he been given some sign from the Almighty? How, otherwise, can his clever but limited mind compute the programs of a Supreme Intelligence? Isn't he or she, after all, simply arguing, like a medieval theologian, that there must be a God because otherwise we cannot explain the exquisite designs of nature—the argument from design? That the cybernetician can himself design intricate, apparently purposive machines does not in principle make him any more able than the carpenter who designs the table to say that systems beyond his control are similarly designed. He or she

cannot even fully specify the alleged purposes of natural systems, as he or she can those of an anti-aircraft gun, for they are beyond his or her ability to design. What is an antelope for? A wolf? A human being? Aristotle's answer of "self-maintenance" might be expanded to "mutual self-maintenance"; but these answers sound rather like a job description for a mechanic, and indeed reveal a profound prejudice in the language of control cybernetics. In revealing this prejudice, we must ask "Is the cybernetician's ascription of purpose to natural systems any more substantive than the poet's description of it in the sunflower?" And, whether it is more accurate or not, "Why is the language of control cybernetics so arid?"

> Ah, Sun-flower! weary of time,
> Who countest the steps of the Sun,
> Seeking after that sweet golden clime
> Where the traveller's journey is done:
> Where the Youth pined away with desire,
> And the pale Virgin shrouded in snow
> Arise from their graves, and aspire
> Where my Sun-flower wishes to go.
>
> William Blake
> *Songs of Experience*

The poet's ascription of purpose to the flower involves several ideas which are basic to the thought of Gregory Bateson and, I think, unsettling to what Bateson called the "Genetic Establishment" in biology. The first is personification: the poet's attribution of purpose to the flower involves his speaking to it as if it were a person. Bateson, who loved to quote Blake, might say that this is a humane way for a human being to treat a flower, for, naive anthropomorphism aside, it substitutes the human notion of purposiveness—mind expressed as person -for the more rigorous mechanistic purposiveness of control cybernetics, and certainly for the materialist, linear cause-and-effect notion of organism characteristic of mainstream biology, where the phenotype of the flower is the effect of a genetic cause, which is in turn the product of random variation and "natural"—sometimes apparently purposive but actually haphazard—selection. Both cybernetics and Romantic poetry—not to mention Plato and Aristotle—have seen the present form of the flower as the result of stochastic process. According to the cybernetician, the poet is making the pretty mistake of projecting his own consciousness onto the flower, which, although it is a purposive entity of sorts, has purposes and a mind of its own quite different from the poet's. The poet might well say that the cybernetician, like the poet, is engaged in anthropomorphism, but not in personification: instead of attributing personhood to the plant, he has reduced it to "machinehood"; in brief, control cybernetics is "dehumanized anthropomorphism" (Bateson's phrase for inelegant scientific description), for it projects the qualities—Cartesian primary ones, to be exact -onto the flower, denuding it of the secondary qualities which are thought to be only characteristic of human consciousness and therefore not only secondary but irrelevant to the objective business of science. This is to say that the control theorist's presumption that "just like any other scientific theory, CT should not just be viewed locally... CT is a theory of all mind, everywhere" (5) is a Cartesian one, in that it generalizes the mechanistic conception of control intelligence to all mind; it therefore carries with it the problems of dehumanization and the domination of man and nature implicit in Cartesianism. This is, I think, what makes more sensitive souls react to the language of control theory as lifeless, boring, and ugly (6); indeed, Blake might agree and, furthermore, castigate control theory as another example of "Single vision and Newton's sleep," characteristic of one-dimensional Cartesian science; except, he might continue, hurling another intellectual spitball (7), control cybernetics is particularly insidious because it presumes to be talking about mind—all mind—in a language

and with a conceptual "system" that in fact reduces mind to a dehumanized, one-dimensional mechanism, man as cyborg: "A self-balancing, 28-jointed adapter-base biped; an electro-chemical reduction-plant, integral with segregated stowages of special energy extracts in storage batteries, for subsequent actuation of thousands of hydraulic and pneumatic pumps, with motors attached; 62,000 miles of capillaries; millions of warning signal, railroad and conveyor systems; crushers and cranes (of which the arms are magnificent 23-jointed affairs with self-surfacing and lubricating systems, and a universally distributed telephone system needing no service for 70 years if well managed); the whole, extraordinarily complex mechanism guided with exquisite precision from a turret in which are located telescopic and microscopic self-registering and recording range finders, a spectroscope…" (8) and, of course, a cybernetic intelligence. One might exclaim with Miranda and Huxley, "Oh Brave New World that has such creatures in 't!"

A further point of intersection, perhaps collision, between the poet's and the control cybernetician's viewpoints is indicated by another idea in Blake's poem: the unity of man and nature. The Sun-flower, the Youth, and the Virgin all yearn for something, "that sweet golden clime/Where the traveller's journey is done;" all are subject to the corruption of time ("environmental constraints"?) and long for eternity (the final "homeostasis") even amidst their (particularly the Youth's) entrancement with the world. All raise their eyes ultimately to some final solice, like Plato's Prisoner escaped from the prison of his own typically human perceptions and values, the shadows on the wall of his cave, or like Dante who, with the help of Beatrice (Divine Love), raises his eyes to the brilliant sheen of Paradise and preternatural rest. This is the poet's vision, amplified by my analogies: all living things, he implies, are possessed of purpose, of desire, and have the ultimate goal of peace. Before we come back to the cybernetician, let us briefly consider another view, to which we shall return. Buddha would agree with Blake in seeing eternity and the realization of all existence as mind and all mind as one—your ultimate identity and mine—to be the result of the cessation of *desire (tanha/trishna)*. Nirvana is complete equilibrium unrippled by the perturbations of time. "My thermostat is currently set in deep meditation," the Buddha might have said when accosted by the demon Mara, "and can be awakened only by the nagging desires of natural existence." The control cyberneticist too understands a pervasive mind in nature; yet this mind is conceived as objective, embodied in the "software" and "hardware" of machines and animals: the biosphere as computer. But remember that the biosphere, ruled by our mysterious lord, Evolution, has produced both poets and cyberneticians, poems and computers, not to mention the vast community of life. This is the ultimate poetry, in the original Greek sense of *poiein*, "to make"—divine creativity. (9)

Is it not bombastic egoism, or *hubris*—to cite another of Bateson's favorite notions, and warnings—that little man now presumes to tell the creation, all minds, everywhere, how they are to think? What if an organism somewhere raises a tentacle and says to the control cybernetician: "I don't care if you are endowed with a lectern in a great American University in the great and, everyone agrees, benevolent American Empire, you may not refer to my experience in terms of your awful language of 'behavior,' 'percepts,' 'feedback,' and the like. You are a petty-bourgeois organism in a civilization so entranced with the application of a lopsided Cartesian science to aggressive industrial technics—referred to in your Newspeak as 'technology'—that you are now ruled by the concepts emergent from your own machines—a creature ruled by his own tools; the tail wagging the dog, I'd say—and now you want to define me that way too. Go and write your bad poetry, but leave me, and the rest of the living world, alone!" The reason that this creature seems so articulate is, possibly, that he has not only been reading Orwell, but also *Continuing the Conversation,* and has paid particular attention to comments made by Ty Cashman in "A Conversation." (10)

Before considering what our heroic non-human has learned from Ty, however, let us consider a Zen Buddhist parable: A Western scholar is visiting a Zen monastery in Japan. He is about to finish his definitive work on this sect of Buddhism, one which will clearly and distinctly lay out the principles of this obscure religion, philosophy, and way-of-life once and for all, but is still puzzled by one last concept. He therefore asks for an audience with a Zen Master, who agrees to speak with him on his daily walk through the high forest surrounding the monastery. As they stroll quietly through the cool shadows of ancient trees, the scholar asks, "I know you're not really supposed to, or perhaps aren't able to answer this question, but if you could at least give me some sort of authoritative hint as to the answer, which I could quote for my book, I'd be much obliged: What is the nature of Satori [enlightenment]?" After an ambulatory silence, the Master retorts in half-serious, half-comic consternation, "How dare you walk with dirty feet through my mind!" By this the Master appears to mean at least two things: first, that, indeed, the scholar is not supposed to ask; he is obtruding with his acquisitive Western ego onto sacred ground; second, that the Buddhist's mind is identical with the Mind of nature—it is manifest in the forest as in the priest. The playfulness of the Zen Master's criticism, moreover, like the fancy of poetry, is an admission that human descriptions are ultimately presumptuous. He who uses the Word must have humility to laugh at himself; otherwise he may become an idolater of the Word and therefore of his own illusions.

The problem of the Cartesian world model is, first, that it, in Ty's apt characterization, observes phenomena through two filters, one admitting only quantitative ("primary-qualitative" in Cartesian terms), the other only qualitative ("secondary-qualitative") data. These two modes of apprehension are, as Ty further explains, impossible to unify because they are based upon mutually exclusive explanatory and even perceptual premises. Mind, second, is reduced to the Ego: *Ego cogito ergo ego sum* ("I think therefore I am") as Ty amplifies Descartes' famous proclamation. The connection between the two is, dubiously, placed in the pineal gland by Descartes; in fact, no explicable connection exists in this epistemological framework. Thus philosophy, particularly since Kant, has careened off in the two directions implied by the Cartesian paradigm: materialism—Ty gives Marxism as an example, although this is not, I think, a clear-cut case (11)—following the objective, and idealism, e.g. Romanticism and German Idealism, following the subjective road. As Bateson says in "The Science of Mind and Order," he thinks that his colleagues in the life and behavioral sciences have built their bridge from the data of human experience to explanatory hypotheses of science, all right, but to the wrong half—the materialist half—of the Cartesian divide. So if they built the bridge to the right half, the Idealist side, they would be fine, wouldn't they? As Bateson's continual reversions to poetry and Scripture, and his final adumbrations of an epistemology of the sacred suggest, however, this is not necessarily the way to paradise or to good science. For it is still locked within the Cartesian "schizophrenia" (Ty's description) of mind and body. Now cyberneticians presume to have solved this problem (12), but have they really? The difficulty is in the assumed quantitative (primary-qualitative) uniformity of nature, which has as its implied observer the Ego (to which secondary qualities are reduced): these are the two termini of the Cartesian system. Control cybernetics, by reducing mind to a form of mechanism—of ideas defined as "differences" in circuits, of purpose conceived in the form of programmable goals for stochastic systems, and of quantifiable information processing—in effect either reduces mind to a material object, or is simply, as I've said, the projection of a dehumanized human ego, rather than the qualities of a person, onto nature. And this dehumanized projection is not only bad poetry, it can be quite destructive, particularly when implemented by high technology and industrial might.

The essential difficulty, as Ty suggests, is that Descartes in the sceptical inquiry of his *Meditations* did not push his analysis far enough: he left the ego as the ultimate identity of mind, the basis for all our thought, including of course our science; but, as Gautama Buddha saw, if you push radical scepticism far enough, the ego too is revealed as an illusion. But it is this illusion which is at the foundation of modern science and, indeed, of our culture.

We hold within ourselves the aggressive egoism and self-righteous zeal of an anthropocentric civilization hypnotized by its own dehumanized image. The core of this has been seen not only by Ty and his interlocutor, Greg, but also by Michael Yocum in his "Reply to Philip Runkel" (13): "What I am trying to say is that you don't really change things very much by substituting a 'control system' in the brain for a 'demon' or 'spirit' in that or some other part of the body." Is it possible that the "control system" in control cybernetics is precisely the Cartesian ego, obeying Descartes' dictum not to project personality onto nature, come back to haunt his scientific progeny in a new disguise? If so, the disguise is a new concept of mind in the machine of nature, including the machine man: the specific garment of disguise is the idea that, since we can rigorously define the mental characteristics of technological human artifacts, we can just as rigorously define the mental aspects of natural "systems"; the difficulty is that this definition carries with it the mentality of technocracy and, ironically, the very machinations of Cartesian science which it tried to overcome. Humanism was perhaps no more accurate, but, at least in its naive projection of personality onto nature, was a kinder illusion.

Buddha thought, as does Ty, that the substitution of illusion for reality was a serious epistemological error, and specifically that the substitution of the subject-object dichotomy—the ego versus the world—was the basis not only of knowledge, but also of desire and therefore of suffering. Bateson thought that "... the cybernetic nature of the self and the world tends to be imperceptible to consciousness, insofar as the contents of the "screen" of consciousness are determined by considerations of purpose." (14) This is, I think, why he developed his learning hierarchy to include an ultimate terminus in the selfless co-thinking of man and nature as one Mind: the resolution of contraries, characteristic of Learning III, "... reveals a world in which personal identity merges into all the processes of relationship in some vast ecology or aesthetics of cosmic interaction." (15) And with the convergence stated here between ecology and aesthetics, Bateson implicitly agrees with Yocum, or vice versa. The bad poetry of control cybernetics is bad because it is egoistical and not sensitive to the multi-dimensional vision of a mind which, having realized, as did Buddha, that the ego too is constructed and so may be deconstructed, becomes the free, autopoietic imagination underlying both good poetry and evolution. This is the cybernetics of non-control, of refusal to control, of wisdom and *autopoiesis*. (16) This is a far cry from the bureaucracy of the sacred, which control cybernetics, like the church, seems to offer in place of the miraculous. Perhaps in a fallen world, one edited, in Bateson's conception, by conscious purpose and egoistical desire (17), rough science and bad poetry are necessary; but we should not lose sight of the good. And so Bateson concludes with Blake:

> To see a World in a Grain of Sand
> And a Heaven in a Wild Flower,
> Hold Infinity in the palm of your hand
> And Eternity in an hour.
>
> "Auguries of Innocence"

1. See Gregory Bateson, "The Role of Somatic Change in Evolution," in *Steps to an Ecology of Mind,* Ballantine Books, New York, 1972, 346-363, and C.H. Waddington, "Paradigm for an Evolutionary Process," in *The Evolution of an Evolutionist,* Cornell University Press, Ithaca, 1975, 231-252. The latter says: "Man in the world is like a caterpillar weaving its cocoon. The cocoon is made of threads extruded by the caterpillar itself, and is woven to a shape in which the caterpillar fits comfortably. But it also has to be fitted to the thorny twigs—the external world—which supports it. A puppy going to sleep on a stony beach—a 'joggle-fit,' the puppy wriggles some stones out of the way, and curves himself in between those too heavy to shift—that is the operational method of science (and of the evolution of biological systems)." (page 246)

2. See Bateson's confession of Platonism in *Mind and Nature,* E.P. Dutton, New York, 1979, 4.

3. See his *De Motu Animalium (On the Motion of Animals)* in the excellent edition with illuminating interpretive essays by Martha Nussbaum, Princeton University Press, 1978.

4. See W.T. Powers' comments in "On Purpose," *Continuing the Conversation* (7), Winter 1986, 1-3, regarding the scepticism of life scientists to the notion of purpose as an explanatory principle.

5. Tom Weathers, Jr., "A Larger View of Control Theory: In Pursuit of the ULOM," *Continuing the Conversation* (9), Summer 1987, 6-7.

6. Michael Yocum, "Half a Loaf?" *Continuing the Conversation* (8), Spring 1987, 3.

7. See Gregory Bateson, "Metalogue: Why do Things Have Outlines," in *Steps to an Ecology of Mind,* Ballantine Books, New York, 1972, 27-32.

8. R. Buckminster Fuller, *Nine Chains to the Moon,* J.B. Lippincott, Philadelphia, New York, London, and Toronto, 1938, 18.

9. See Percy Shelly's *A Defense of Poetry* for this view of the poet's art.

10. Greg Bechle, Ty Cashman, and John Dunne, "A Conversation," *Continuing the Conversation* (6), Fall 1986, 1-3.

11. Anthony Wilden, for example, has developed a rigorous, cybernetic Marxian perspective in *System and Structure: Essays in Communication and Exchange,* Tavistock, London, 1972.

12. Weathers, op cit., 6.

13. Michael Yocum, "Reply to Philip Runkel," *Continuing the Conversation* (9), Summer 1987, 3-4.

14. Gregory Bateson, "Effects of Conscious Purpose on Human Adaptation," in *Steps to an Ecology of Mind,* Ballantine Books, New York, 1972, 444.

15. Gregory Bateson, "The Logical Categories of Learning and Communication," in *Steps to an Ecology of Mind,* Ballantine Books, New York, 1972, 306.

16. For example, see Humberto R. Maturana and Francisco J. Varela, *Autopoiesis and Cognition: The Organization of the Living,* Reidel, Boston, 1980; Francisco J. Varela, "Not One, Not Two," *The Coevolution Quarterly* (11), Fall 1976, 62-67; Michael Yocum, "In Lieu of a Reply to the Powerses," *Continuing the Conversation* (9), Summer 1987, 4-5; and Erich Jantsch, *The Self-Organizing Universe,* Pergamon, Oxford, 1980.

17. Gregory Bateson, "Conscious Purpose Versus Nature," in *Steps to an Ecology of Mind,* Ballantine Books, 1972, 426-439; especially 434-436.

Errata

The editor wishes to apologize to the author and to readers for two errors which appeared in Michael Yocum's article "In Lieu of a Reply to the Powerses" in CC Number 9. The first sentence after the Maturana quote on page 5 should read: "And yet, in order to maintain that boundary which is me, there must be ways of crossing it; that is, it must be an interface." Also, the last complete paragraph in the first column on page 5 should read: "And, of course, I disagree with her when she says that 'Aesthetics reside in the eye of the beholder.' That which we call 'beauty' and 'ugliness' arise from the *relationship* between the beholder and that which is beheld; and, further, that relationship has meaning (including 'beauty' or 'ugliness') only by virtue of existing in multiple contexts."

To Michael Yocum:

From Mary A. Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1987 by Mary A. Powers.

I don't know why you prefer to respond to me (and Bill) by way of third parties—perhaps because you want to distance yourself from people who use words like "wetware"? (Hard to know why you conclude that I am fond of the word—I used it once, in a sentence in which it fit nicely in contrast to "hardware" and "software." I think, on the evidence, that I am much more fond of words like "and" and "the.")

There are a lot of points raised in the letters to Greg and Phil; some directed at me, some at Bill. They are interesting because Bill's battles for a long time have been with the scientific (or whatever—psychological science being something of an oxymoron) establishment, and here comes a critique from the aesthetic and philosophical side.

Of course error-correcting circuits pass through organisms—right out into the environment where the disturbances are that the organism's outputs are attempting to correct. Error-correcting circuits that do not pass through, but that remain within, only *think* they are doing their job. Various names for this: imagination, fantasy, dreams, hallucinations.

And certainly other things pass through the boundary between organism and environment, and certainly organisms would not exist without an environment, nor would the environment be what it is without organisms in it. If control theorists appear to focus too heavily on their model of internal organization, it's because there's never been a workable model before for that part of the organism-environment complex, while there have been good models of the outside (such as physics and chemistry). And another thing the control model tries to explain is the interaction between both. Which means, among other things, being very careful indeed with the idea that the environment (or the perception of it) influences behavior. The same environment (an approaching storm) which "influences" you to seek shelter may "inspire" someone else to shuck their clothes and go out and dance.

A paragraph by Maturana may "fill" you with admiration while it "fills" me with negative thoughts about meaningless verbiage. The environment does not influence or inspire, or fill either of us with anything; it is simply there, available to perception and to the construction of more and more complex perceptions. And how these perceptions stack up in relation to what we want to perceive in terms of dryness in wet weather, or an expectation of comprehensibility in those we are urged to admire, is a function of the way we are organized, not the environment. Yes! No matter how much I am in and part of and interacting with and nonexistent without an environment, I maintain a boundary between it and me, a highly permeable boundary, to be sure, but also highly selective and asymmetrical. When I can't do it any more, I will be dead. This is not to say that I therefore feel I have license to push the environment around because I am organized and it is not,

especially since most of my environment is other organisms. But it does mean that something like aesthetics does reside in me, and not out there, because while I need something to perceive in order to make an aesthetic judgement, aesthetic judgements can't be made without a control-type organization, with reference levels, to make them. And if judgement seems too cognitive or intellectual, how can you tell you're experiencing aesthetically unless at some level you're comparing the experience with something else? You've certainly made the judgement that I (and other control theory people) are much too mundane and nuts-and-bolts to be as aesthetic as you. We don't take enough walks in the woods to appreciate the living world. Or something.

On to another subject. Machines have purposes designed into them, and living systems have purposes, but not on purpose. Is that it? Somehow the purposes of living systems "arise from the recursive nature of their organization in relation to other patterns and to the non-living universe." Yes. Well. The point is this: machines that have purposes are able to do something about those purposes because of their organization: they have reference signals and input signals, and comparators to compare them, and outputs driven by the computed error that produce actions that make the inputs more like the reference signals. That, my friend, is a gloss on the phrase "recursive nature." That is the recursive nature of control machinery. It has nothing to do with being able to take it apart and reassemble it. Until it is assembled it is not a control system. The transistor I used yesterday I may not use today. The components are not at issue; how they are organized is.

What is the recursive nature of living systems? Nothing we will ever know or learn by making up Greek words and calling it autopoiesis. What we can do, however, is this. We can hypothesize that in living systems are the functional equivalents of inputs and outputs, comparators and reference signals. We can go further and point to this or that neural signal or part of the brain and say it surely looks like a comparator or whatever. They may not be discrete, reusable entities like transistors, resistors, and pieces of wire, but we are looking for a particular kind of organization, not for parts to sum. Nor are we looking at a particular location in the brain for a control system that is running the whole show, although it is certainly clear that specific control functions are located in specific places. Because we know quite a lot about how simple, human-made control systems work (and they aren't that simple), we are emboldened to guess that living systems are organized in much the same way. And when we make that hypothesis, a lot of very novel and interesting ideas about behavior appear—ideas which flatly contradict many assumptions held by life, social, and behavioral scientists. We think we see new insights into the way babies grow, into psychotherapy, into stress, into teaching, into social systems, into conflict, into economic theory, into every kind of human endeavor. You are certainly entitled to prefer perfecting your aesthetic knowledge; we hope to do something substantive in the world so that future generations can exist, in the first place, and, in the second place, find something left on this planet to have an aesthetic relationship with.

Two Projects: Representing Action. Planning "Control"

By Geraldine Fennell (59 Rennell Street, Bridgeport, CT 06604). Copyright 1987 by Geraldine Fennell.

Writing on the subject of "control" in recent issues, contributors to this newsletter are airing a difficult and important topic. This note is meant to place a few additional considerations in the hopper. Its main objective is to underscore a distinction between (a) trying to understand human behavior, and (b) using that understanding to consider issues of "control." In fact, three projects should be kept separate: (A) Working to gain a formal understanding of human behavior, to some consensually adequate

criterion, (B) Using such understanding to discuss, concretely and in detail, how one human might try (i) to change or (ii) to participate in another's behavior, and (C) Exploring the moral implications of trying to "control" behavior in senses (i) or (ii), a project I shall not address here.

For Project A, some people find it helpful to model action, which means, broadly, constructing an orderly context in which action is one constituent. In so doing, it's fine to use "control" in a strictly technical sense, as in "controlled variable." If we go on to ask "Is control located in the organism, environment, or both?" we use "control" in a non-technical sense. Mingling the quite different implications of "control" by a human agent, and by the inanimate environment, we needlessly risk confusion. Moreover, the question deflects attention from the differentiated nature of organism, and environment. Accordingly, my strategy is to distinguish Projects A and B, i.e., to present an account of action without using the concept of "control" (A), thus providing a framework within which students of "control" may pursue their interest (B).

When pursuing Project A, placing action in a conceptual landscape that comprises more than action itself can be helpful. For me that broader context is a *behavioral episode* in which allocating the individual's resources is at issue. I assume that humans comprise many systems (otherwise, perhaps, "controlled variables") some of which may be regulated behaviorally, rather than purely physiologically. Resources most be allocated to effecting adjustments in such systems, on an irregular basis as well as regularly recurring. With regard to classes of adjustment that recur regularly (e.g., preparing/eating meals, teeth-brushing) there is a tendency toward streamlining, and some components of the resource-allocating process are bypassed. Accordingly, to help readers see the many-faceted nature of behavioral resource allocation, I use non-regularly recurring instances to illustrate a behavioral episode in which action may be a constituent.

1. *Resources Directed to an Unattended Domain*. Consider Everyman. Like the rest of us, Ev has various susceptibilities. Working at his desk, the noise of drilling outside his window intrudes and he considers how he can shield his ears. Having missed breakfast, he feels hungry, and calculates the time before he can eat. Considering proposals that he attend his child's school play, and join the country club, he feels uncomfortable as he considers the ramifications of doing neither. When Ev is sleeping, someone says his name in conversational tones and he awakens. Looking at a hard-to-read message, he strains to see the letters clearly. Reading an ambiguous message, he considers various possible meanings. While listening to conversation after a substantial dinner, he recalls that chocolate mousse is still to come and, anticipating its arrival with impatience, Ev muses about possible reasons for the delay. Learning that *Fidelio* is scheduled, he considers how he will make time to attend.

In all of these instances, Ev has been affected in one way or another. At the very least, for some period of time in each instance, his resources have been commandeered and channeled in a particular direction.

Our structure, genetic and acquired, is such that some events in our environment, or present in imagination, rivet our attention, in fact, compel us to allocate resources to a certain substantive domain for a measurable period of time. We would not want it otherwise. It is to our advantage to be capable of being alerted to threats and opportunities that arise unpredictably. Many events occur that do not so compel our attention. If someone were blowing a dog whistle in Ev's neighborhood, he would not have been considering how to shield his ears. When Ev was sleeping, if the wake-up caller had said "Jim," he would not have awakened. If rice pudding were on the menu, Ev may not have lost track of what his dinner companion was saying, or if the announcement of upcoming operas had featured *Carmen*, he would have moved on without a second thought. With regard to *allocating resources*, that is, channeling an individual's resources to one substantive domain

or another, the individual's structure operating automatically acts as gatekeeper. For the remainder of this note, I'll consider just the first of the examples mentioned above—Ev's being interrupted by the sound of drilling outside his window.

2. *Does This Substantive Domain Need Continued Attention?* When focal attention has been thus compelled, the individual may make a judgment that no significant threat or opportunity exists, and return to what he or she was doing before the interruption. Recalling seeing a notice that repairs required fifteen minutes drilling at 10:30 am, Ev decides to ignore the intrusive sound and return to work. (Such *focal appraisal* likely involves a cursory costworthiness estimate (see (4) below) including, here, the cost of generating candidate things to do).

3. *Are There Appropriate Adjustments I Can Try?* Twenty minutes later, Ev finds himself again giving focal attention to the noisy drilling, now, in earnest generating and choosing among candidate defensive measures. Note that the *substantive domain* to which Ev's resources are currently allocated (e.g., intrusive noise) and his *criterion of value or instrumentality* (e.g., noise reduction efficacy) have been jointly selected by his structure and the events that require a repair crew to drill noisily in his vicinity at that hour. Within the domain of noise reduction, the particular stimuli (e.g., hands, ear plugs, cotton, headphones) that Ev generates reflect the kinds of instrumental things (1) that he can think of (reflecting, in turn, his previous experience, direct and vicarious, his ability to recall under stress, and to see non-obvious uses for things) and (2) that he believes may be accessible in his environment. The stimulus, and accompanying movements, that Ev selects as top candidate depends on the actual content of his accessible environment, his ability to recognize instrumentality, and his view of the relative advantages/disadvantages of available alternatives.

4. *Is Environmental Adjusting Warranted?* Whether or not Ev acts (i.e., observably) depends on his estimate of the costworthiness of his top candidate action. (Is it worth going up three floors to get a pair of ear plugs?) The outcome of a costworthiness review depends on Ev's assessment of the degree and likely duration of his current discomfort, the amelioration likely to ensue from taking action, and the costs of acting (e.g., effort, time, bothersome or harmful side-effects).

5. *Was Attempted Adjustment Successful?* Ev inserts ear plugs. He is aware of new sensations—of pressure inside his ears, of the altered sound of his breathing and of his fingers on the computer keyboard, and of the slightly muffled drilling of the repair crew. "When she returns from her meeting, I must ask Eve to lend me her Walkman," Ev mutters to himself as he returns to his work. After an additional ten minutes, Ev finds his attention focused once again on the noise and the pressure inside his ears. Noticing the time, he thinks of taking an early lunch. Included among his candidate actions for dealing with the noise, this new option rises promptly to the top. Feeling greatly relieved at escaping the noise and the pressure of the plugs, Ev plans to drop by Eve's office on the other side of the building as he leaves for lunch.

6. *Aftermath*. When Ev returns from lunch carrying Eve's Walkman, drilling has ceased. Retrieving his train of thought, he goes back to work. Later in the day, noticing the headset and the ear plugs lying side by side, Ev recalls the inadequacies of the ear plugs and muses about possible reasons why they had not been more helpful. He is scarcely aware of noting to himself that in similar circumstances in the future he will try some other means of reducing the discomfort of loud noise.

An account of a behavioral episode, along lines such as the preceding, may be used in somewhat different ways. With regard to understanding behavior (Project A), basic scientists may want to vary the way they represent a behavioral episode depending on the task in hand. The episode may be characterized by just three terms: Change (1), Attempted Counterchange (2)-(5), and Learning (6), or its description may be greatly expanded to make micro-details explicit. One may focus attention on a contemporaneous account of Ev and his environment, i.e., as they may be

characterized at the beginning and during the focal episode (my personal preference), or on the historical antecedents of such characterizations.

Similarly, students of interpersonal influence (Project B) may use behavioral representations that result from Project A to consider how one individual might try to "control" another, addressing questions such as: (1) What is the "controller's" behavioral objective? It could be to *change* behavior in some way (compared to a baseline of nonintervention), for example, by (a) ensuring that an individual allocates resources to some substantive domain or criterion of value (see examples under (1) above) or by (b) trying to increase/decrease the frequency with which an individual engages in some activity, such as voting or littering. Or the "controller's" objective could be to *participate* in ongoing behavior, for example, given that some individuals are made uncomfortable by noise, let's design effective ways to help them deal with the discomfort. Given that some individuals like to gamble, let's raise revenue that way. (2) Considering each aspect of a behavioral episode (such as those distinguished above, or others), what opportunities for influence are open to a "controller," in principle and in practice? (3) What means can "controllers" use to try to avail of such opportunities, e.g., arranging for: (a) certain kinds of stimulation—physical or symbolic—to reach the target's senses, or (b) certain kinds of objects to be present/absent in the target's environment?

If interpersonal "control" in any sense of the word is possible, it is because the "controller" is tapping into a naturally-occuring behavioral process. That means "controllers" are *adapting their actions* to the target individual. Accordingly, to begin to spell out the possibilities for such "control" and to promote communication among people who are interested in the subject, it is best to focus first on representing the naturally-occurring behavioral process (Project A), and then on identifying opportunities for "control" that such representations uncover (Project B).

Feedback

By Philip J. Runkel (Division of Educational Policy and Management, College of Education, University of Oregon, Eugene, OR 97403). Copyright 1987 by Philip J. Runkel.

Sometimes in reading an article or a letter to the editor in CC in which the author compares cybernetic terms to terms in psychology or other social sciences, I worry that a correspondence or analogy is being stretched too far. Frequently I worry about *feedback*.

For a good many years now, *feedback* has been a technical term in the application of principles of group dynamics to communication in natural groups. Susan is giving Howard *feedback* when she tells him the effect of his behavior or utterances on her. "Susan gave Howard positive feedback" means that Susan liked what Howard did or said.

Feedback, of course, comes from cybernetics. In a system with feedback channels, one or more features of the output are transferred (fed back) to sensors connected to controls of the input. The feedback alters the input and consequently the output. In the language of cybernetics, if increases in output cause the feedback to *decrease* the output, the feedback is called *negative feedback*. Negative feedback keeps the output of a system within bounds. If increases in the output cause the feedback to *increase* the input and then the output still further, the feedback is called *positive feedback*. Sometimes positive feedback increases levels of variables in the system to a range where negative feedback sets in and the system equilibrates in the new range. In other instances, runaway increase in the feedback loop continues until the system destroys itself.

In cybernetics, positive and negative feedback have no evaluative connotations; neither is necessarily good or bad. But for the sake of making a contrast, let us assume that we do not like to see a system destroy itself. With that assumption, we can say that in cybernetics, positive feedback is bad, negative good. But in the current jargon of applied group dynamics, the reverse holds: positive feedback is good, negative bad. The reason, presumably, is that *positive* has become so often used to mean good and because people usually like to be told that what they are doing is good. Without checking with the local cyberneticist, then, Howard can thank Susan for the positive (good, pleasing) feedback he got from her.

Three Conceptions of Conversation

By Stuart A. Umpleby (Department of Management Science, George Washington University, Washington, DC 20052). Copyright 1987 by Stuart A. Umpleby.

Following the meeting of the American Society for Cybernetics in St. Gallen, Switzerland, last March, I found myself reflecting on the different assumptions that cyberneticians make about how to conduct a conversation.

Conversations occur on several levels and are conducted for several purposes. Depending on one's purposes, people choose different styles of conversation. Within the American Society for Cybernetics at the present time, there are at least three different conceptions of how to conduct a conversation. One way both to "continue the conversation" and to advance cybernetics is to share our different assumptions about the art of conversation.

Before I describe the different ideas regarding how to converse, I think it would be useful to review what people are conversing about. Although this summary is greatly oversimplified, suppose that we identify three philosophies or points of view.

1. Realism is associated with classical science. The idea is that scientific laws are discovered rather than invented, that a real world exists, and that the task of science is to create theoretical pictures or models of the real world. Observations are assumed to be independent of the characteristics of the observer.

2. Constructivism is a newer point of view which is critical of realism and is struggling to replace it. According to constructivists, scientific laws are invented rather than discovered. Although the existence of a "real world" may be a useful assumption, constructivists would insist that it cannot be known without a knower, and that the correctness of the theories created by the knower cannot be established without the presence of a second observer with direct knowledge of the "real world." However, this second observer would operate under the same constraints as the first.

In constructivism, the focus of attention is an observer. Constructivists sometimes make the distinction between "trivial constructivism"—the idea that different observers interpret their experiences differently—and "radical constructivism"—an exercise in the philosophy of language.

3. An additional point of view might be called "an ecology of concepts," until a better term emerges. In addition to an observer and what is observed, this view adds attention to the society in which observers live and occasionally struggle for status and influence. Whereas constructivism emphasizes the "one-brain problem," the idea of an ecology of concepts focuses on the "n-brain problem." Rather than explaining the relationships within an observed system (realism) or the physiological nature of an observer (constructivism), this viewpoint identifies a number of conceptual systems operating within a social system and examines how they are employed to achieve the goals of the various actors. This approach recognizes that although theories are developed in part to explain some aspect of the world of experience, they also can be used to establish and maintain certain social relations.

The advocates of the third position are quite comfortable with the idea that "the society" and the actors and conceptual systems in it are in turn constructions in the mind of an observer.

These three different points of view are associated with three different conceptions of how to design a conference.

1. Those who use a philosophy of realism tend to assume that an academic meeting should use the classical design of formal papers presented in panels devoted to specific topics with questions and comments from the audience.

2. Constructivists envision a conference as an opportunity for friends to get together to continue an on-going conversation. Formal lectures may be given but are less important than thoughtful but leisurely conversation which, it is felt, is most likely to facilitate the emergence of new distinctions. The idea behind this type of conference is not to report on results achieved in a laboratory far away, but rather to use the conversation during the conference to generate new results.

3. Those who view a social system as a collection of groups using different points of view are inclined to design a third type of conference. This approach prefers to combine elements of the first two. People are invited to give formal presentations which reveal what they are able to establish using their assumptions and methods. However, by putting on the same panel people who use very different assumptions, the discussion tends to draw out these different assumptions. The idea behind this approach is that people frequently forget the questions they were asking and the assumptions they made long ago. The intention is to use conflict to reveal unstated beliefs and to discover the limits on any system of ideas. Each set of ideas is usually quite effective at dealing with some questions, but not particularly effective at dealing with other questions. If a society is regarded as a collection of points of view, then understanding the usefulness and the limitations of each point of view becomes a key concern.

With three such different approaches to the design of a conversation, there are numerous opportunities for conflict. In the early days of the American Society for Cybernetics, the dominant point of view was no doubt that of realism. However, by at latest 1980, the strongest voices were those of the constructivists. By now the realists have been hounded out of the Society in the name of a newer, more informed point of view, but those who display insufficient devotion to constructivism can still be accused of "not understanding." This behavior maintains the boundary so that the conversation among those devoted to a particular set of ideas can continue.

In recent years, the third point of view has been put forward more frequently. There have been efforts to bring into the Society people who have developed other conceptions of cybernetics. While granting the enormous contribution of the constructivists to cybernetics, the third group of people have felt that other contributions should be recognized as well, and that the limitations of the constructivist position as well as the limitations of other positions should be explored.

These efforts have been resisted by the constructivists by a variety of means. They suggest that other theorists do not understand constructivism, and that conflict disrupts the conversation and thereby impedes progress. In addition to direct statements, more subtle strategies are also employed. When the topic of conversation shifts to something other than constructivism, a criticism is made of the language used, thereby redirecting the focus of attention to issues of language and hence constructivism. The struggle to control the agenda also emerges in debates over who should be invited to conferences, how sessions should be designed, and what topics should be covered. In terms of topics, advocates of the third position want more sessions to be devoted to social systems, whereas constructivists prefer to limit the range of topics to issues associated with language and neurophysiology.

Constructivists tend to assume that there are two points of view, realism and constructivism, and believe strongly that constructivism is the superior point of view. Perhaps by considering the third point of view, we shall be able to see the suggestions for additional topics and alternative designs for some conference sessions in a new light -not as suggestions put forward by people with an insufficient devotion to constructivism, but rather as proposals to advance recent work in an additional direction.

Upcoming Conferences

1987 American Society for Cybernetics Annual Meeting, Dec. 2-6, University of Illinois at Urbana-Champaign. "Creative Cybernetics: Our Utopianists' Audacious Constructions." Contact Mark Enslin, 203 E. Oregon, Urbana, IL 61801; (217)344-6583.

1988 United Kingdom Systems Society Conference, July 12-15, University of Hull, ENGLAND. "Systems Prospects: A Conference on the Next 10 Years of Systems Research." Contact M.C. Jackson or P. Keys, Department of Management Systems & Sciences, University of Hull, Hull HU6 7RX, ENGLAND. Abstracts due by March 31, 1988.

Job Announcement

Anticipated faculty appointments for January or August 1988, Department of Engineering Management, Old Dominion University, Norfolk, VA 23508. Send resume and names of three references, attention Dr. Laurence D. Richards, Chair. A particular need is for individuals with interest in knowledge systems, human performance engineering, technological policy in society, computer simulation, and/or behavioral decision theory.

Continuing the Conversation

A Newsletter of
Ideas in Cybernetics

A New Format *

From now on, *Continuing the Conversation* will be typeset for better readability, and to allow the incorporation of high-quality illustrations. We hope that you like the new format; please let us know if you have suggestions for additional improvements.

This issue includes more responses to the Batesons' *Angels Fear,* replies to criticisms of feedback models in biology, and a comment on Stuart Umpleby's article about styles of conversation in cybernetics, which appeared in *CC* #10. Additional contributions for subsequent issues are invited in all of these areas, *and* in another area which appears to be both neglected and controversial: the utility of cybernetics. (Specifically, *should* cybernetics be useful? If so, in what ways, and for whom? If the notion of the usefulness of cybernetics makes sense, then how can that usefulness be promoted? And how, in general, should questions like these be approached?) Deadline for the next issue is March 1, 1988. Why not become an *active* participant in the conversation?

On *Angels Fear*

By Klaus Krippendorff (Annenberg School of Communications, University of Pennsylvania, 3620 Walnut St., Philadelphia, PA 19104). Copyright 1987 by Klaus Krippendorff.

Angels Fear is Gregory Bateson's (G.B.'s) well-founded fear for a culture, our culture, that may destroy itself by its very success. It is a book that goes much deeper than the usual fears of atom bombs, genetic advances, and ecological disasters, into the deep structure of these phenomena, and roots them in mind, both human and social. Although his *Mind and Nature* did some of this before, the warning in *Angels Fear* is clearer, tied to epistemology and to such concepts as dichotomy, logical typing, mythology (story telling), information, redundancy, pattern and structure, circularities, description, the role of the unconscious, faith, etc. Many of these ideas are drawn from cybernetics, and are extended here to human communication, social process, and culture. One could say that it still is Norbert Wiener's program carried into the 80s and beyond, though much more tentative and caring.

Angels Fear is far less coherent than *Steps to an Ecology of Mind* and *Mind and Nature,* even with Mary Catherine Bateson's carefully constructed connective metalogues between chapters. They too raise important issues, often without making the effort of developing them towards some kind of conclusion. One can clearly feel G.B.'s lack of time before his death and, perhaps, the editor's effort to preserve much of the material in its raw form. More than his other publications, *Angels Fear* seems reflective of a man who was for most of his life at the cutting edge of thinking, but who, by pushing the breakthrough point in front of him, never enjoyed the satisfaction of having gotten there.

* For the 2009 restoration, all issues use this format

Perhaps there is a deep connection between his always almost getting there and his conservativism.

I particularly like how G.B. contrasts his own approach with the California counterculture in which he thrived, and that made him into a guru. He could have taken a scientific perspective and dismissed certain practices and beliefs as untenable or meaningless, but in search of affirmative knowledge for "the sacred that would celebrate natural unity," he positioned himself instead right "between the Scylla of established materialism with its quantitative thinking, applied science, and 'controlled' experiments on the one side, and the Charybdis of romantic supernaturalism on the other." *(Angels Fear,* page 64) In this respect, his position resembles that of Carl Gustav Jung (whose famous "Seven Sermons to the Dead" led G.B. to the concepts of *Pleroma* and *Creatura),* who was equally unwilling to settle on either side of a distinction and instead advocated the search for a unity as well.

Is it a good book? I don't really know. Is it an important book? That depends on whether you are willing to look, and able to remain sufficiently open to ponder the widely ranging and unevenly distributed ideas. I for one found my mind boggling, and I am sure I will read the book many times for ideas yet to be discovered. Concerning G.B.'s own epistemology, for example, the claim that "the gap between the observer and the supernatural is covered by faith" (page 96) makes him far from being a naive realist, as some have accused him. He did not talk about the gap between the observer and the observed, the supernatural being beyond perception and a cognitive construction above the construction of the ordinary. Add to this that "faith is in believing that seeing is believing" (pages 96-97) makes his construction a self-referential one, one that is constitutive of seeing. This links his work to radical constructivism, to which it brings concepts from psychiatry (the unconscious) and religion (the sacred and faith) and shows a deep concern for the well-being (absence of pathologies) of mind.

With a book so rich in ideas (at least for me) it is impossible to describe the chapters or examine its contributions. Let me therefore mention only a couple of uncertainties of my own. One has to do with easily misleading words. For example, G.B. defined information (already in his previous books) as "any difference that makes a difference." This is a very seductive definition. Its first noun apparently locates differences in reality outside the human receiver, the difference between paper and ink, for (his) example, and its second use of the same noun refers to the relative importance of this difference. Both paint the receiver as passive and merely responding to what an existing difference does. I am not sure whether G.B. intended this in view of his later assertion that data are always made by observers (are descriptions of description, forms of forms) (page 166). Suppose observers, who see themselves as receiving information, actively differentiate whether there is a difference to begin with or whether the act of differentiation creates this difference as an important one. If this is so, information ought to be defined in receivers' terms and include a voluntaristic element. With all his emphasis on epistemology, one could have expected greater clarity at least on concepts that are essential enough to be listed in his glossary.

Another uncertainty, perhaps the same as the above but reaching far further, concerns his unyielding reliance on Bertrand Russell's Theory of Logical Types. G.B. owes many productive concepts to this Theory, and it is undoubtedly true not only that "the map is not the territory," but also that the map, being *about* a territory, is on a logical level *above* the territory it claims to represent. The Theory of Logical Types implies a hierarchy of logical types that supports an epistemology which in turn justifies social hierarchies. In fact, G.B. devotes a whole chapter to the basic idea of feedback as a model for his approach, and he shows how one feedback loop is embodied in a part of a whole that embodies a higher-order feedback loop, which in turn may be embedded in a still higher-order loop, etc. The control hierarchy this entails very much resembles the social construction of industrial and military organizations. I can't deny the usefulness of such creations, but they may be faulty on the bottom, on the top, and in between.

On the bottom, the distinction among logical types makes sense only if one can compare the map with the territory. G.B. recognizes that the territory belongs to Jung's *Pleroma,* which "has no map, no names, no classes, and no members of classes" (page 21). How can we then compare such a formless and unknowable entity with its map? We can't! Yes, "the map is not the territory," but there is no territory without a map! They mutually define each other, and any use of maps involves us in a constitutive (self-defining) circularity that is explicitly ruled out in the Theory of Logical Types.

On the top, the end is out of sight as well, but for different reasons: as soon as we want to explain (make a map of) the master controller, we must resort to a logical level higher than that controller, and construct a super-controller, which in turn needs to be explained by a hyper-controller, etc. The infinite regress this entails is not inherent in nature, but in the Theory of Logical Types plus the desire to explain things. G.B. takes the Theory as a logical standard when complaining that "most local epistemologies—personal and cultural—continually err, alas, in confusing map with territory and in assuming that the rules for drawing maps are immanent in the nature of that which is being represented in the map" (page 21). I am convinced that the epistemology G.B. chides for erring may not be so pathological. It is an epistemology in which the top is reentered on the bottom and thus supports itself! Such a circularity (not to be confused with the circular causality of ordinary feedback) underlies Spencer Brown's *Laws of Form,* Francisco Varela's Calculus of Self-Reference, Jon Barwise and John Etchemendy's *The Liar,* and Heinz Von Foerster's Second-Order Cybernetics—to name but a few—and is constructive of several autologies, for example, autopoiesis. Somehow I wonder if G.B.'s fear stems from being held captive to the Theory of Logical Types. Ecology, which he knows so well and draws on in many instances, is hardly hierarchical.

In the middle, the Theory of Logical Types leaves little choice. In control hierarchies, obedience to the level above is passed on as oppression to the level below, perhaps in support of a common goal. In descriptive hierarchies (descriptions, descriptions of descriptions, ..., descriptions of... descriptions), the syntax is fixed from above, and the choice of terms is constrained by the content to be described. Either leaves out self-determination, autonomy, and mind. The only way to get rid of these logical consequences is to replace the restrictive Theory of Logical Types by one that allows circularities to enter, which can then explain why the belief in the Theory of Logical Types reifies itself in all kinds of hierarchies whose experiential consequence almost always is oppression.

G.B. and Jung—to make a last observation—seem to have more in common than is often realized. The work of both is committed to science, but also is prophetic. Both have probed deep into the unconscious, including their own. G.B. was an anthropologist close to family therapy who relied on cybernetic concepts, Jung was a psychoanalyst who relied on his own psychiatric practice. But whereas G.B. generalized a cybernetic notion of mind to the functioning of culture, Jung relied on culture (mythology and symbolism) to shed light on psychological realities inside individual beings. Most curiously, they came to rather different conclusions, however. Whereas Jung's fear for the survival of humankind is founded in the fear that individuals might not come to grips with their own unconscious, might not be able to balance and transcend the dichotomies language creates, and to prevent these oppositions from taking over their lives, G.B.'s fear is rooted in just the opposite, that a certain core of things should be *left* in the unconscious, untouched, unanalyzed, and not talked about, for fear that tampering with these might destroy the very fabric of society, the very ecological balance that enabled us to be.

Not Only Angels Fear

By Philip Lewin (Liberal Studies Center, Clarkson University, Potsdam, NY 13676). Copyright 1987 by Philip Lewin.

My first response upon reading *Angels Fear* was gratitude to Mary Catherine Bateson for undertaking the labor of love and humility and humor that produced it.

My second was a sense of wonder, as though I had been guided by Gregory Bateson through an enormous chamber of the soul, and had been shown things large and elusive in a way that preserved their mystery, that left their darkness unobscured. And, made privy to the gropings and hesitations of the mind that guided me, I also felt invited to think along with it, to also explore this vastness. For that too I am grateful.

What struck me about Bateson's argument was how much it seemed to complement that of the German philosopher Martin Heidegger. Briefly, I find Bateson's naturalistic epistemology converging with Heidegger's existential ontology. If Bateson awakens us to the conditions of how we know, Heideggger sought to awaken us to how our knowing is enabled by the known, how Being allows itself to be known. I would like to reflect on this convergence here.

A central theme of *Angels Fear* is the communicative epistemology of mental process. As the dynamics of creatural knowing are described, faith emerges as characteristic not only of religious knowing, but of the creatura generally. The powerful ideas of difference and of "difference which makes a difference," so fruitful in Bateson's earlier thinking, seem here re-vivified in the idea of "gaps," of the essential discontinuities intrinsic to the world of mental process—gaps within the living, gaps between phenomena and our descriptions of them, gaps within levels of description.

> It is commonly thought that faith is necessary for religion—that the supernatural aspects of methodology must not be questioned—so the gap between the observer and the supernatural is covered by faith. But when we recognize the gap between *cogito* and sum, and the similar gap between *percipio* and *est,* "faith" comes to have quite a different meaning. Gaps such as these are a necessity of our being, to be covered by "faith" in a very intimate and deep sense of that word. Then what is ordinarily called "religion," the net of ritual, mythology, and mystification, begins to show itself as a sort of cocoon woven to protect that more intimate—and utterly necessary—faith. *(Angels Fear,* pages 95-96)

The complement to gaps is what Bateson here calls "structure," a necessary algebra of morphogenesis and learning, of anatomy and evolution, that specifies the implicit "rules" that bridge the gaps. Through structure, an explicit content—of development, of knowledge, of form—is organized and sequenced.

The epistemology of creatura, as presented in *Angels Fear,* is elusive, but elusive of necessity. On the one hand, it is the play of structure that grounds mental process, that allows it to make the new connections that are the "self-healing tautology" of epistemology. Yet, on the other, consciousness directly experiences none of this; the play of structure covers over the gaps, allowing the *cogito* the possibility of epistemological error, of being incorrect about its own nature and its relation to what it knows. The unfortunate and unnecessary consequence of this error, at least in the West, has been the ego's imperializing arrogance. The explicit sub-theme of *Angels Fear is* to sound the warning that it is the forgetfulness with which we permit our discourse to reify relations, to pleromatize the world of mental process, which lies at the heart of a fundamental epistemological pathology widespread in our culture. Bateson proclaims the need for creatural syntax and semantics, isomorphic to that which they would describe. To a degree, Bateson's concerns in *Angels Fear* mark an end of the study of religion in the conventional sense of god-images and organized worship, and a call for an expansion of religious modes of discourse—the discourse of creatura—to imbue the entire interconnected world of wholes, of patterns which connect, with the sacred.

A similar set of insights informs the thought of Heidegger. As Bateson re-visions the religious through the possibilities of holistic thinking, so Heidegger saw the end of metaphysics and philosophy as conventionally conceived, due to the increasing hegemony of positivist science and the possibilities contained in first-order cybernetics. In a lecture delivered in 1964, Heidegger observed:

> No prophecy is necessary to recognize that the sciences now establishing themselves will soon be determined and guided by the new fundamental science which is called cybernetics.
>
> This science corresponds to the determination of man as an acting social being. For it is the theory of the steering of the possible planning and arrangement of human labor. Cybernetics transforms language into an exchange of news. The arts become regulated-regulating instruments of information.
>
> The development of philosophy into the independent sciences which, however, interdependently communicate among themselves ever more markedly, is the legitimate completion of philosophy. Philosophy is ending in the present age. *(On Time and Being,* page 58)

I find the echoing of Batesonian themes in these remarks to be intriguing, though to the best of my knowledge neither ever acknowledged the thought of the other. Still, we might draw Bateson and Heidegger closer through Peirce's concept of abduction. Peirce found it serendipitous—both wonderful and completely unanticipated—that humans possess the ability to make fruitful guesses about the world, that our intuitions so often turn out to be instrumentally effective. "Abduction" is his term to describe this phenomenon, that "the human mind is akin to the truth in the sense that in a finite number of guesses it will light upon the correct hypothesis." *(Collected Papers,* 7.220) Bateson alters Peirce's idea of abduction by deleting its ontological reference and making it entirely epistemological. For Bateson, abduction is a form of reasoning through perceived similarity, a modulating on familiar themes, a thinking through analogizing. As such, it is the epistemology of the "metaphor in grass," entirely and exclusively characteristic of the creatura. However, in a way congruent with Peirce's original conception, Heidegger returns to the ontological through the specific theme of how the world lets itself be known.

Like Bateson, Heidegger too was fundamentally concerned with what he saw as the unfortunate consequences of epistemological error. His lifelong concern was with the way in which fundamental ontology, Being, had been covered over by modes of knowing adequate only to reveal the ontic, the being of particular beings. For Heidegger, an adequate epistemology is concerned with *aletheia,* that is, with understanding the moment of acquiring truth as a moment of unveiling Being, or of bringing it forth from concealment. This moment, in which Being is gathered into itself, Heidegger saw as a making or *poesis. Aletheia* involves a collaboration between what Being offers and a circumspectful approach by the knower, lest his or her blundering and misconceptions cover over that which would be revealed. Our very being as human is an instance of *aletheia,* for we are *Dasein,* a "there" in which Being presences to itself. In the past, this rhythm of an offering-from and a response-to also included technology, *techne,* seen as a form of unconcealment, an act of bringing-forth.

In themselves, science and technology as modes of knowing pose no problem, but our time has witnessed their triumph as the sole adequate epistemologies, and the privileging of what they reveal as identical with the nature of reality itself. In contrast to an embedded knowing, Heidegger saw the essential quality of modern science in its development of representations, and of modern technology in its aggressive instrumentality. What might this mean?

Insofar as the theories of science are taken to represent the world as it is, the world can *be* only as it is so represented. To state it negatively, the influence of scientific modes of knowing has been so pervasive that those experiences and modes of experiencing that do not lend themselves to representation in terms of science are suspect, are ontologically ungrounded. This is clearly the intent of the logical empiricist program of the early years of this century, with its relegation of all statements not clearly based on observables to nonsense. But the more recent repudiation of logical empiricism does nothing to change the impact of Heidegger's critique. In our time, that which *is* in a fundamental sense is still that, and only that, which science represents. Like Husserl before him, Heidegger saw that Western science had forgotten its grounding in lived-experience, and that the world-pictures which it promulgated were endowed with a higher authority than the collective human experience which had engendered them. As a result, *Dasein,* the presencing of Being in human existence, is lost to itself. The epistemology of representation makes *Dasein* no longer an embeddedness of Being, but an object like any other, a thing that stands-against us as in a picture, separate from our lived sense of ourselves, alien and disembodied. And if humans can be reconceived in their essence to be no more than instrumentally manipulable objects, is it surprising that the creatura in general would come to be regarded the same way?

Similarly, the danger of the instrumentality of modern technology lies in what Heidegger called "enframing." In contrast to the sense of technology as a "circumspect unconcealing," an *aletheia,* the enframing of modern technology "conceals that revealing which, in the sense of *poesis,* lets what presences come forth into appearance." *(The Question Concerning Technology and Other Essays,* page 27) Enframing confronts and challenges Being; it seeks instrumental control over it, reducing it to expedient, calculated use, rather than reverencing it as itself. The approach of enframing "threatens man with the possibility that it could be denied to him to enter into a more original revealing and hence to experience the call of a more primal truth." *(Ibid.,* pages 27-28) In other words, it is an act of fundamental alienation, a rejection of that which we essentially are.

In much the way that Bateson shows how gaps function to both reveal and conceal, to simultaneously render apparent and to cover over, so Heidegger wished to re-attune us to the simultaneous revealing and concealing of Being, to how, in the presencing of Being, that which presences covers the ontological as it manifests the ontic. And in much the way that Bateson argues that our modes of description must be isomorphic to the

nature of the phenomena to be described—and that our discourse should not reify creatura as though it were pleroma—so Heidegger stressed the importance of the manner of recognition. Even if philosophy was ending, he saw that the task of thinking would remain more crucial than ever. For Heidegger, the event of *ereignis*, "appropriation" or "enownment," an event in which full consciousness of that which already is is taken, becomes a foundational moment for all reflection. Heidegger described this as a moment in which the thing is situated in its fullness, in what he identified as the fourfold panoply of earth and sky, of gods and mortals. In Bateson's terms, we might say that appropriation is a moment in which systemic interconnectedness is acknowledged.

Yet having said all this, having analyzed once again our widely recognized spiritual alienation and suggested once again that the cure lies in some manner of re-connection, I surely anticipate that the cries of these prophets will continue to go unheeded. From where I stand in the late 20th century, I see not even tentative signs of healing, but rather enormous outpourings of fragmentation, anomie, chaos. The vision of re-integration offered at the end of *Angels* Fear—that somehow the wisdom of systemic thinking will not only become pervasive, but will inspire a renewed sense of responsibility toward the living (see pages 180-182)—seems puerile, surprisingly naive. As an anthropologist fundamentally concerned with systems, it is astonishing and saddening that Bateson omits any serious historical grounding or economic analysis of social systems. Despite the admiration I have for his ideas generally, this omission devastates his optimism, making it shallow, sentimental, and wishful. My own sense is that the unmocked but surely insulted gods of natural systems, like the pantheon of offended deities of our cultural and social systems, have barely begun to reveal their beauty or their terror. The times are desperate, and not only angels fear.

Puffing Salt on the Demon's Tail

By Peter Harries-Jones (24 Highview Crescent, Toronto, Ontario, CANADA M6H 2Y2). Copyright 1987 by Peter Harries-Jones.

Anthropologists rarely forget their initiations. Mine was a Bateson half-life ago at Oxford, and consisted of an essay to be written in my first week there. The title of the essay was to the effect that anthropology must become history or it will become nothing. The "history" to which the title referred had little to do with documentation and evidence of past action; it was "history" stripped of Cartesian delusions of objective documentation of circumstances. "History" meant "the idea of history"—a search for self-knowledge.

Like history, anthropology informed western civilization about the structure of society in which *we live*. But it did so as the complementary form of historical imagination, saying the same thing differently. Ethnographic evidence presented truths about ourselves obtained through evoking the visions of others. Never should ethnography be treated simply as a record of esoteric customs and practices of "other cultures." The initiate had to understand the concept of a mapping of a switched form.

The intellectual heroes of those days were Collingwood and Vico. *Angels Fear* returns me to them. (1) As an initiate, I was mistaken in believing that the Angels' *mysterium* was dedicated only to the subject matter of anthropology, not to survival and its attributes, *res sacra* (matters pertaining to the sacred).

Though *Angels Fear* is far more than an anthropological text, its significance for anthropology is profound. I propose to discuss this under two headings: first, structure; second, symbolism and "the sacred."

Structure

The notion of structure is a key concept in anthropology. It is rare to have a new conceptualization of this notion, and each is epoch-making for the discipline. Bateson reconceptualizes structure. "Structure" is some notion of generality, "the algebra of that which is to be described." Arithmetic may be the science of particular numbers, but "algebra is the science that arises when the word 'particular' is replaced by the word 'any'." (*Angels* Fear, page 152) Like the notion of "any," structure is one degree more abstract than particularities. Especially to be avoided is "a false notion that the more concrete details subsumed under a given named structure are somehow *really* components in that structure." (page 153)

In one sentence, Bateson uncovers an error haunting anthropological conceptions of structure for thirty years or more. The dominant anthropological form of "structure" from 1935 to 1%5 was represented as a form of branching in an explicitly defined space, the space of kinship relations. Kinship branching was marked by boundaries which at first seemed to be remarkably distinctive and well defined. In the late 1960s, anthropologists began to realize that they had confused form and content, "the branch" with its "membership." The membership's social relations outran "the branch" to which they supposedly belonged, hence "structural principles" were exceedingly difficult to ascertain. Not only that, but the particularities of branch membership were confused with the very generalities of the notion of structure itself.

In the late 1960s and 1970s, "structure" took on a different form, one very close to the conception of mathematical groups. While structuralism presented a more abstract—and therefore more generalized—representation of the relation of social phenomena to each other, it failed to overcome the initial error. The primary features of structure remained those of "connectivity" and the ways in which connections, apartness (isolation), or conjunctions came into being and were either maintained or changed. Central to this conceptualization was that "in nature as in mathematics every form is a content for 'higher' forms and every content form of what it 'contains'..." (2) One advantage of the new structuralism was that it led to study of how group boundaries and their patterns were maintained by processes of self-regulation. "There can be no doubt," wrote Jean Piaget, "that it is this latter conception (self-regulation) which makes the idea of structure so important." (3)

The interactions of structuralism were, in Bateson's language, "pleromatic." Networks of connectivity order structures. The networks are reversible, but reversibility of order takes the form of reciprocity, rather than inversion. And with this vision, structuralism set out on its quest for mind. *Angels Fear* departs radically from Piaget's concept—and from those of Levi-Strauss, Godelier, and countless lesser known anthropologists who made their careers supporting "structuralisms." Bateson discusses structure in relation to discontinuity rather than connectivity, and though the point may be evident to cybernetics, it is not to anthropology.

Of course, social science understands some of the implications of discontinuity. For example, it examines hierarchies composed of levels of organization. It understands that concepts and techniques which apply at one level of a hierarchy do not necessarily apply at levels above or below. What is lacking is an appreciation that their fundamental character is "gappiness." To distinguish a level is to distinguish a boundary; to distinguish a boundary is to focus on the means of communication occurring between levels.

The structural argument of *Angels Fear* is that every level of discontinuity has to be considered with reference to the types of communication existing "in the gap" between them. Social science stops with description of regulatory "circuits" proper to each level. It ignores the *necessary relation* among internal

regulation of levels, the form of communication between levels, and "structure." (4)

Sonic commentators in the last issue of *Continuing the Conversation* have said that there is nothing new in this discussion. In fact, by taking the boundary phenomenon as an extra level of complexity, Bateson reformulates the dialectic of continuity and discontinuity considered in *Mind and Nature.* In that book, processes of thought leading to new propositions were defined as a series of discrete steps, zigzagging between formal components—ideas, propositions, premises, and the like. As critics had complained, this model constrained the possibilities of reordering premises in any hierarchy to a very limited range of values.

In *Angels Fear,* there is continuity in the domain of process. This reformulation is far more in keeping with David Bohm's notion of "becoming" and the "movement of thought." The processes of thought are in continual movement, perusing the form of well-defined ideas and perceiving through mind the variety of relationships of identity and difference. Relations at the boundary include *twist* (contraverting a local distinction); *complementarity* (situations where A and B are presented, but the perception of A excludes the perception of B, and vice versa); *self-reference;* and *switch* (in pattern of communication). Bateson declares that the gap between formal components provides for the discontinuities necessary in ordering hierarchical structures, not the process of thought itself. *(Angels Fear,* pages 165 ff.)

There is another aspect of the model of structure which is new. Creatura exhibits not only links in patterns of relationship which recursively refer back to themselves ("self-reference"), but patterns which seem to "refer forward." I take referring forward to be an aspect of reconnection among distinctions; in other words, an underlying pattern of unity which occurs recurrently, and which is the central theme of *Angels Fear:* the pattern of the sacred.

Symbolism and the Sacred

Most anthropologists would find Bateson's approach to the sacred bleak indeed. Conventionally, the study of the sacred is undertaken through analysis of symbolism. Symbolism is documented either pictorially or linguistically (e.g., in myth), or documented through ethnographic examples of the "acting out" of symbolism in ritual. In either case, all symbolic activities have definite meanings. Anthropologists contribute to dictionaries of symbolism, and where more obscure ethnographic examples produce new meanings, the whole forest of uninterpreted symbols is the subject of special monographs.

The meaning of symbolism is always considered to be a pathway to the structure of the sacred. So, in studies of the sacred, the anthropological error of confusing form and content is still with us.

In *Angels Fear,* the discussion of metaphor is related to classes of predicates and their juxtaposition of relations. This is a remarkable break from the structuralist interpretation of metaphor, which implies an analogue to harmonic processes in music. The structuralists say that if harmony allows for the transposition of a melodic phrase from one instrument to another, then metaphor is a means through which symbolic themes consistent with one context are transposed to another.

Metaphor is a vehicle through which boundaries between the natural and the supernatural are overcome. Through metaphor, symbols are transcontextualized. A series of transpositions takes place, as for example when activities of exchange in This World are transposed through metaphoric reference to an exchange between This World and the ancestors of The Other. Typically, the exchange may involve an act of sacrifice, plus the distribution of the sacrificial object among members at a ritual. This symbolizes gift giving. (5)

Not all anthropologists have approached the concept of the sacred through this seamless web of symbolic reference. Sperber has attempted to rethink symbolism through reanalyzing symbolic forms as "absent meaning." Symbolism here is not referential, rather it acts upon the constructs of memory. It orders by placing uninterpreted events in quotes. At a later date, symbols can be recalled in a manner similar to that of the memories of smells. Symbols are *bricolage* in every dimension; they are on their own feedback loop, lying alongside feedbacks of cognition. They have no localized significance, yet are readily available for construction of thought. (6)

Nevertheless, even Sperber cannot overcome conventional anthropological interpretations of the sacred which fundamentally rely on constant references to things named. Anthropology incorporates a western cultural preoccupation to interpret God, religion, and the ancestors as givers of names. Thus anthropologists exhibit their own unreflective adherence to Judeo-Christian imperatives.

Such an interpretation of symbolism and metaphor is a cheap representation of what really happens, argues Bateson. Religious unity, which incorporates the sense of the sacred, lies at an interface between the named and the unnamed. (7)

To repeat a theme of *Angels Fear,* both science and religion interpret this interface as lying between order and chaos, and then rush to explain the sacredness of the ordering process. For Bateson, the interface is a chance to examine significant similarities of immanent worlds lying on both sides of the interface, though these similarities can only be known in the metaphors and propositions of one of them—Creatura. The interface reveals limitations on knowledge, and unavoidable gaps in every attempt at description. Yet metaphor and symbolism do contain their own realization of the ordering of relations; these are implicated in our own survival.

Of course *Angels Fear* goes beyond discussion of the premises of the sacred in an immanent world. Bateson states that noncommunication is also characteristic of the sacred, not only in the pragmatics of ritual, but as a structural condition as well. Very large systems of ecological size and larger are characterized by constraints on the transmission of information among their parts. Some information should not reach some locations to assert the *real* nature of these systems... or "to assert the existence of that whole whose integrity would be threatened by inappropriate communication." (page 135)

Such statements might suggest that rumor-mongering is prohibited among the host of angels. An alternative interpretation, in keeping with Bateson's earlier writings, is that ignorance—like error—is a necessary condition of human existence. There can be no Unified Form, no Absolute, no leap of faith from the partitioned world into a world of wholeness and unity. Sacredness cannot be revealed, as it can never be fully known.

The message from *Angels Fear* is twofold. Anthropology must redefine its dualism of sacred/profane. Science must redefine its notions of rationality and perfectability to take ignorance into account as a fundamental state. Both are necessary for thinking about human survival.

But then, which anthropologist besides Gregory Bateson has tried to enter inside the *mysterium?*

And who else has succeeded in putting salt on the tail of Maxwell's demon?

Notes

1. For the "syllogism in Barbara," read Vico's "decline into barbarism," that barbarism of reflection "where thought still rules, but is thought which has exhausted its creative power and only constructs meaningless networks of artificial and pedantic distinctions." See R.G. Collingwood, *The Idea of History,* Oxford University Press, Oxford, 1961, page 67.

2. Jean Piaget, *Structuralism,* Routledge & Kegan Paul, London, 1971, page 112.

3. *Ibid.,* page 14.

4. In a strict sense, "structure" refers to a threshold, to a setting or bias which asserts fluctuation between limits of a bounded system. But "structure" can not be interpreted except as it appears in an interface—the meeting place between bounded systems. *(Angels Fear,* page 39) The generalities of structure refer to what sort of meeting place the setting or bias of two bounded systems refer. Is there a difference of logical type? Is the difference that of a single crossing of a threshold, or a double cross (i.e., a crossing of a threshold in one system which is perceived in another system as a difference in average threshold values of the other)?

5. Sacrifice and distribution create channels through which reciprocities can flow to and from the Other World. In Christianity, the grace of God can flow to the devout believer; the donor of the sacrifice is Christ himself, and the priest in the communion service distributing the "body and blood of Christ" is "timelessly repeating the sacrifice at the behest of the Divine donor." See E. Leach, *Culture and Communication,* Cambridge University Press, Cambridge, 1976, page 92.

6. D. Sperber, *Re-Thinking Symbolism,* Cambridge University Press, Cambridge, 1973.

7. Nevertheless, anthropology has always noted the conditions of immanence present in the epistemology of sacredness and has a long history of interpreting the sacred in terms of the distinction (as Vico first suggested) between *verum* (the condition which conserves languages, institutions, and beliefs) and *certum* (human experience at any given moment of what is: particular decisions, actions, and events). See D.F. Pocock, *Social Anthropology,* Sheed and Ward, London, n.d. (ca. 1961). Bateson does anthropology an injustice when he suggests that anthropological distinctions—as between the symbolism of magic and religion—are drawn from a nineteenth century evolutionary perspective.

Angels Fear and
the Understanding of
Aesthetic Rationality

By Jürgen W. Kremer (Saybrook Institute, 1772 Vallejo St., San Francisco, CA 94123). Copyright 1987 by Jürgen W. Kremer.

I would be lying if I didn't say that I had anxiously awaited *Angels Fear.* And I would be lying if I wouldn't admit to the disappointment that the book presented. Maybe it could not have been otherwise (for me). The book does not really seem to go beyond what I heard Gregory Bateson say during the last years of his life, and it does not really seem to go beyond what is in his dispersed last publications. This is where my disappointment hinges.

But that was not my only response. There was the old excitement and joy of reading his thoughts in book form. There was the admiration for Mary Catherine Bateson's Herculean task (it is hard for me to imagine how a more excellent job could have been done). There was the anticipation of more of *her* work. There was the familiar pleasure of strolling with Gregory Bateson through well-known territory and getting another whiff of his thought processes. There was the fun of seeing the daughter casting the father in the metalogues instead of the reverse. All these were responses which made me enjoy the book.

Probably the most succinct way to state my disappointment would be to say that, indeed, Gregory did *not* tread where angels fear to tread—his discussion of the sacred and aesthetics are but promissory notes. "Certainly what he wanted was still amorphous at the time of his death, the thinking still incomplete." (Mary Catherine Bateson on page 5 of *Angels Fear)* Thus, I consider this book another seed, the kind of seed that he was so adept at planting in person. And it is up to us now to make the seeds grow.

Part of my interest in *Angels Fear* stems from my concern with aesthetics. Bateson's previous remarks had raised my expectations for this book. I consider his chapter on "Style, Grace, and Information in Primitive Art," in *Steps to an Ecology of Mind* (1972), one of his seminal papers in this regard. Overall, his move to emancipate aesthetics from the arts seems to be a crucial shift. Günter Holl, his German translator, has analyzed this in a remarkable book on Bateson's work (1985).

This cosmological stance toward aesthetics can be indicated by the following quote from *Mind and Nature* (1979, pages 8-9): "I would define that word [aesthetics], for the moment, by saying that they [Bateson's students] were *not* like Peter Bly, the character of whom Wordsworth sang:

> *A primrose by the river's brim*
> *A yellow primrose was to him;*
> *And it was nothing more.*

Rather, they [the students] would meet the primrose with *recognition* and *empathy.* By *aesthetic,* I mean responsive to *the pattern which connects...* I faced them with what was (though I knew it not) an aesthetic question: *How are you related to this creature? What pattern connects you to it?"* Obviously then, in Bateson's view, aesthetical questions can only be approached from a systemic viewpoint. Aesthetics focuses on relationships: the relationship of consciousness to unconsciousness, of self to cultural environment /society, and of self to natural environment. *Angels Fear* (page 199) reflects this stance: "Every work of art depends on a complexity of internal relations and can be seen as another in that family of examples that can be looked at to understand 'the pattern which connects' and the nature of Creatura. 'It took a lot of thought to make the rose.' Aesthetic unity is very close to the notions of systemic integration and holistic perception. And arguably the appreciation of a work of art is a *recognition,* perhaps again a recognition of the self." And—one might add—the appreciation of nature is the same kind of recognition process.

Natural beauty can be seen as a critical parameter in aesthetic considerations. Nature contains the promise and possibility of integration. In that sense, natural beauty serves also a constructive function (beyond the critical). Art, for example, is oftentimes seen in terms of deficiencies of natural beauty. However, as Adorno has pointed out, "nature is not yet what it appears to be... as long as nature is exclusively defined in terms of its opposition to society." (1984, page 97) This, again, raises the issue of systemic integration. Entailed in all this is a "view of the human species as in-and-of-nature... a non-objectivating perspective... quite different from the view of the human species as set over-against-nature that lies behind the objectivating sciences." (McCarthy, 1985, page 190)

Aesthetics is the study of processes in the creator or onlooker whereby beauty is created and acknowledged—be that in the arts, be that in any of the other creations of information by humans, or be that in non-human nature. All these can be looked at from the viewpoint of systemic integration, from the viewpoint of the beauty of problem solutions they show.

Gregory Bateson's notion of reason entails an integration of all the different aspects of rationality. And by integration I mean more precisely the following. For reason to be reason-

able, it needs to be an active process of critical tensions and interactions between all the different aspects of rationality (the rational-purposive, the moral, the aesthetic, etc.). Bateson's well known statement (1972, page 145) on the *truths of consciousness* is relevant here: "If, as we must believe, the total mind is an integrated network (of propositions, images, processes, neural pathology, or what have you—according to what scientific language you prefer to use), and if the content of consciousness is only a sampling of different parts and localities in this network; then, inevitably, the conscious view of the network as a whole is a monstrous denial of the *integration* of that whole..." I would contend that aesthetic rationality is a crucial ingredient in reason, however, it is not the final criterion for what our discourses may regard as truths.

Aesthetics—according to the notion that I am sketching here—is concerned with ideal-form principles of natural or artistic or scientific or technological processes of problem solution. A scientific discourse (say a piece of research on emotions) is as much subject to aesthetic criticism as is a work by Joseph Beuys or Vincent van Gogh. If the aesthetic is an aspect of reason, and if there is a rational basis for aesthetic considerations, then we need to appeal to the compelling force of the better argument in disputing questions of beauty. Where, then, does the aesthetic discourse find its basis of rationality? What are the kinds of reasons that the aesthetic discourse needs to concern itself with?

The label I have for my preliminary answer to these questions is *alignment.* Alignment refers to:

1. The alignment of the elements *within* human beings (for example, the state of the dialectic between cognition, emotion, the body, the numinous, and the sexual).

2. The alignment *between* human beings—in the attempt to establish constraint-free and sincere interactions (and this includes all socio-cultural creations).

3. The alignment between human beings and their natural environment.

4. The alignment between different elements of nature (which has become an issue only since the beginning of severe human intervention). All this can be argued more clearly in a constructivist vein, given more space. (It might be crucial to note right at the start that there are multiple solutions to alignment problems, that a multiplicity of beautiful alignments can be seen, and that each one of these alignments can be consensually validated, meaning that they are embedded in a multiplicity of consensuses.)

Please note that I am not suggesting these four aspects of alignment as ultimate evaluation criteria. However, I do propose them as process issues to which an aesthetic discourse—given the enlarged Batesonian notion of aesthetics—needs to attend. And it is in these realms that reasons for aesthetic judgements can be given. The state of any process of alignment can be argued.

Let me take the example of the aspect of the alignment process between human beings and their natural surroundings. Whether the current relationship between humans and nature is in fact beautiful and aesthetic is something which can be argued. If we determine that humans fail to see themselves sufficiently as part of nature, then we can develop arguments for the beauty and the lack of beauty of this.

The question of alignment appears to me to be one of the crucial tests for the quality of our stories. This applies from the scientific story to all the other stories that make up the discourses of societies. Do our stories further or hinder alignment? Can we demonstrate a coming together of the rational-purposive (logocentric) and the corrective processes of the larger (numinous, archetypal, emotional, physical)? Can we demonstrate a coincidence of the rationally known and the felt sense of correctness—which would be wisdom? (Cf. Mary Catherine Bateson's

beautiful discussion of this concept, 1977.) This means, in the realm of intersubjectivity: is there a *genuine* consensus, where there is not only no counterargument left, but where consensus also carries the conviction of an experienced correctness? Openness to corrective processes, the experiences of the larger, ensure that power is not the basis of any such consensus (and, again, keep in mind the multiplicity of solutions to alignment issues).

One of the implications of this understanding of alignment is that we can be happy only if we act as autonomous, responsible human beings in ever-unfolding projects toward new and ever-new critically achieved consensuses. And this is the motivating force of aesthetic discourses, which argue the states of the process of alignment. But the goal of these is not so much aesthetic judgement as it is giving credibility to a certain type of reality creation and reality experience.

Aesthetic discourses which address alignment issues help reason to its culmination—which would be wisdom. In wisdom, *all* aspects of reason live in a critical, evolving tension.

These are some of the notions that I am working with. I have developed them further in other places (Kremer, 1985, 1986, 1987). Most of this is stimulated by Gregory Bateson's work. That *Angels Fear* "is a testament, but one that passes on a task not to me only but to all those prepared to wrestle with such questions" (Mary Catherine Bateson on page 2 of *Angels Fear)* seems more than appropriate as an open conclusion to his life work. *Angels Fear* is certainly an encouragement to fearfully dance where angels fear to tread. After reading the book, I felt more compelled than ever to clarify my thoughts on the sacred and aesthetics (which I then did in a presentation at the American Psychological Association Convention in New York, from which parts of this paper are taken). In this sense, the disappointment that the book presented has been very constructive for me.

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Time, Words, Knowing, Information

By Rhoda Gilman (510 Michigan St., St. Paul, MN 55102). Copyright 1987 by Rhoda Gilman.

Time has pressed hard on me ever since I started laboring to shape some thoughts around the questions raised by *Angels Fear.* Now another deadline creeps up, and time still presses. Maybe I should shed the silver manacle on my wrist—or pull my sleeve over its face—and at least try to phrase the questions.

Time. The central question. All biological organisms are creatures of it. They grow and die. The pattern is shaped at some point by an irreversible stochastic process. The arrow points one way. "Mind" in Gregory Bateson's definition permeates the process. Does mind partake of time? Or time partake of mind?

In one of his conversations, Krishnamurti said: "Thought, after all, *is* time, isn't it? Thought, which is the response of memory, knowledge, experience, is from the past." But if thought is time, then what of mind?

Words. Language communicates thought. Crystallizes it, defines it, keeps it in memory for future pondering. Without words, thought as humans know it cannot exist. Does language also influence time?

Three thousand years ago—give or take a few centuries—the fleeting sound of words was captured in signs. Thought was preserved for a few hours, a human lifetime, or a hundred lifetimes, it didn't matter. The capacity of mind to turn back upon its own thoughts and to build upon the thought of others grew. Looking at the written record of the past, we humans saw the shape of time stretch out into linear space. The harnessing of language had expanded thought—and also time.

Almost at once, Greek philosophers and mathematicians started the Western world on its path of analyzing and measuring experience. Concepts that humans hoped might transcend time only expanded it further. They produced deep time, deep space—vast intellectual constructs beyond experience and beyond human capacity to truly apprehend. In the other direction, time shrunk to equally inconceivable minuteness, but it never disappeared.

Simultaneously in the East, a different result followed. Prince Gautama meditated on the fleeting nature of experience and perceived the impermanence of all things that exist in time. The line never curves back upon itself. The arrow loosed cannot return. He and other yogis began to ask: can we not escape from time by casting off the yoke of thought? Can mind accomplish this? Can the creature of time touch the realm of no-time?

Knowing. The Ancient Mariner achieved liberation as he "blessed them unaware." Mary Catherine Bateson asks: "When is it important that systems sustain internal boundaries by a sort of profound reflexive ignorance?" *(Angels Fear,* page 86) I hear an echo of her question at the College of Saint Benedict conference in 1985: "Is it possible that the demand of science to learn and analyze ultimate truth is in fact destructive of an essential system?" Should we therefore restrain our appetite for thinking? Can we best know the system by transcending thought itself? And if we transcend thought, do we also transcend time?

Krishnamurti again: "We must find out what the present is... Can you be aware of 'the now,' know what it is? Or do you only know the past, the past which operates in the present, which creates the future?... To understand 'the now' is an immense problem of meditation—that *is* meditation."

Information. Captured on microchips, it is not thought. Neither are word-signs captured on paper, but they profoundly affect the process of thought. Will information in computers do the same? And will it have a parallel effect on time? How does this magnified speed of thought, captured in symbols and machines and mediated through multiple minds, relate to a biological process regulated and limited by time? Is this the real

path that angels fear to tread? Where did it begin? At Olduvai? In Mesopotamia? In Athens? In Alan Turing's study? How far have we already gone along it unaware?

And what about that other path branching off 2500 years ago? Will the two rejoin? We know we have to bring them together. But the gap is wide, and in it lie frightening depths of irrationality. Gregory Bateson struggled to build a bridge. And in *Angels Fear,* joined by Mary Catherine, he cautiously adds to the structure. But the final spans are still missing, and I sense a certain trembling as he extends the beams. Mary Catherine, dancing to the edge and back again, shows more nerve than Gregory. Although the questions remain, they have been made a little clearer.

A Letter about *Angels Fear*

From Janie Matrisciano (RR 1, Box 483, Readfield, ME 04355). Copyright 1987 by Janie Matrisciano.

Dear Greg Williams,

Since you wanted a personal response to *Angels Fear,* and since letters are my best genre, I have cast this as a letter to you. In fact, as soon as I started *Angels Fear,* I was so excited that I dashed off a letter to Mary Catherine Bateson. It never got beyond the draft stages because of babies and moves, but here's how it started:

Dear Mary Catherine Bateson,

I have just started reading *Angels Fear* and am finally moved to write to you. I was stopped in my tracks by the sentence on page 8 that reads "Might the concept of the sacred refer to matters intrinsic to description, and thus be recognized as part of 'necessity'?"

Have you ever read Doris Lessing's *The Sirian Experiments?* I have treasured it as the only fictional embodiment I have ever seen of the idea of learning as I learned it from Gregory in *Steps.* I have in fact treasured Gregory and Doris Lessing (and George Bernard Shaw) as the best teachers I have found in life, short of one or two people I have known personally over the long haul. And now perhaps I've found another key echo between them in the concept of "necessity."

In *The Sirian Experiments,* in case you haven't read it, the higher civilization called Canopus, in the person of a character called Klorathy, teaches the lesser civilization called Sirius, in the person of a character called Ambien. Teaches what? It's hard to define, but it's something like an understanding of what it means to be a "higher" civilization. Whenever Ambien can't understand why Klorathy/Canopus does something, Klorathy refers to "The Need" or says that he acts "according to Necessity." I have always had a hard time explaining this idea to friends (I'm the only person I know who has read the book), but that's part of the point: it is not easy to make a simple formulation of the basis of "The Need."

However hazily defined, the idea of "The Need," as the Canopeans use it, seems to be a key to a problem that has bothered me for a long time: how to justify and perhaps recognize and define a set of fundamental concepts or values that should be common to all people, even while we give everyone the "freedom" to hold diverse value systems. Gregory's ambivalence about taking purposive action to "fix" the modern world, as you portrayed it in *Our Own Metaphor* and *With a Daughter's Eye,* seems to me to be related to this.

My favorite illustration of the problem is a comparison between China and the United States. The Chinese have recognized the limitations on resources like water, they have realized that there is a corresponding limit to the population

the country can support, and they have instituted strict restrictions on the birth rate. This approach combines an admirable sense of limits and proportions with a troubling coerciveness. On the other hand, the U.S. is an admirably "free" country where we are pretty much endlessly uncoerced and therefore "free" to pollute, pillage, and otherwise jeopardize the present and future. I am bothered by the problem of how to define (and even more problematic, how to implement) a set of values and responsibilities that we all need to agree on, while allowing for the diversity of different cultures, different beliefs, and different value systems.

The idea of "The Need" has always seemed to fit this need (I can't seem to get away from this pun) even though it is not very well defined. Now I realize that this may be the direction in which *Angels Fear* is headed—and I'm excited as I haven't been in a long time by the promise of some new thinking. This is all the more fun for me, because Gregory's writings about art and religion seemed to be key areas that were left unfinished and that I am rather incapable of finishing by myself! Not that I expect *Angels Fear* to "finish" these topics, either...

I wrote these paragraphs when I had read only a few pages of *Angels Fear.* Reading back over them now, after finishing the book and rereading *The Sirian Experiments* for the nth time, I see that I am not very well able to "Gregory" or "Doris" these matters. But I keep trying.

Let me try to weave some thoughts together in reaction to these books—weaving the books together and weaving some patterns that will help me go forward with my own thinking.

Values

Sirius as yet lack[s] a sense of the appropriate.
The Sirian Experiments, page 91

In the *Angels Fear* metalogue about addiction, the Father's voice says:

In any case, the shift of attention from individual to interactive process moves us away from questions of value. Instead of good or bad we can think in terms of "reversible" or "irreversible," "self-limiting" or "self-maximizing." (page 132)

In Gregory's world of formal discourse, it may in fact be *necessary* to get away from the discussion of values, especially in such simplistic terms as "good" and "bad." In Doris Lessing's world of Canopeans grounded in "The Need," the discussion of values would be superfluous, because the value system is inherent in "Necessity."

But in our own everyday world, it is hard to get away from questions of value. Even *Angels Fear* is full of value words, words like excellence, health, fit, harmony, and utility on the one side, and disease, disruption, ugliness, pathology, error, and inappropriateness on the other. One of my strongest reactions to *Angels Fear* has to do with this question of values, one that haunts me as I sit here, troubled by the state of the world but mostly content to remain an armchair philosopher who leaves the world-changing to other people. Changing things, what Gregory calls "being useful," requires both a clearheadedness about values and a confidence that certain actions will have the desired result. I share his hesitancy, especially about the latter.

The strongest of several echoes in *Continuing the Conversation* #10 of the concerns I find running through both Gregory's work and some of Doris Lessing's novels was Dan White's statement (on page 14): "This is, I think, why he [Gregory] developed his learning hierarchy to include an ultimate terminus in the selfless co-thinking of man and nature as one Mind..."

Usefulness

... both these vehicles have *and cherish* the notion that they are going somewhere.
Angels Fear, page 170

When you start talking about being useful, you sound like your mother.
Angels Fear, page 205

Our planet and our species seem to be in trouble (we must make a value judgment to say this). How can we improve matters? Gregory and Margaret Mead keep debating this issue from beyond the grave, with Mary Catherine as the medium who adds her own perspective. Gregory seemed to think that most attempts at improvement would make matters worse. Mary Catherine doesn't entirely share his pessimism.

The question of usefulness is also in part a question of values, of the relative valuation of value systems. Usefulness comes in two major varieties: 1) a holding action against the forces of evil (dissolution, pathology, disharmony)—in other words, the effort to mitigate the effects of "bad" value systems so that there's still a planet left while process 2 works its slow way "somewhere," and 2) "positive" action, in the form of pushing people and their affairs in the direction of "somewhere."

There is a third activity, however, that may or may not come under the heading of "usefulness" of the kind Gregory mistrusted so much: the effort to keep going "somewhere" oneself; to tend one's own garden even while not interfering in the affairs of the rest of the world. This is a strand that runs through various traditions, including some meditation traditions like Zen. This approach to the problems of the world is based on the idea that you can't expect to affect the rest of the world if you haven't worked on yourself first. Simplistic thinking, perhaps, but Gregory's work contains a great deal that could be taken as support for the idea that change comes not from the effort to change, but from the effort to understand.

But even in Zen there are teachers. Can anyone in reality tend only one's own garden without affecting other parts of the world?

Learning and the Facilitation of Learning

We all see truths when we can see them.
The Sirian Experiments, page 8

The tram becomes a bus by gaining experience, not by having things explained. But what if others can help by facilitating the right kinds of experience?

In *The Sirian Experiments,* the Canopeans never really *explain anything* to Ambien. Instead, they trigger her participation in situations that eventually help her to "see the truth when she can." She then finds herself in the same position visa vis her colleagues: she can't explain. Explanation must *follow* experience, or at least accompany it; it doesn't sink in, can't really be heard, if it comes beforehand.

Gregory would still probably ask: how do you know that your useful actions or teachings will lead to the end you want? Are you sure you're right about what's pathological and what's harmonious, about what belongs to Necessity? A major part of our problem is how to get that grounding in "The Need," coming as we do from our perhaps pathological cultures and frames of reference. Can we bootstrap ourselves "somewhere"? Is bootstrapping in fact the only way we'll *ever* get there?

Logical Levels

We all see truths when we can see them, and the very process of writing this has made me realize that my concern about values is in part a matter of logical types. As in the natural world, health

and harmony imply diversity, but not at all levels. At the level of the laws of physics, there is no diversity; in this universe, as far as we know, there is only one set of laws of physics. (See Gregory's discussion of "laws" of various kinds on page 159 of *Angels Fear.)* Diversity comes not at the level of the sacred, but in its varied expressions in human cultures, rituals, religions, arts, etc. What I call "common values," what *The Sirian Experiments* calls "The Need," what Gregory calls "a natural unity," is a logical level above the diversity of human cultures. To use a different metaphor, it is at a level beneath the cultural, in the sense that it provides (or should provide) the base or foundation for diverse cultural expressions.

An Addendum: Two Dolphin Thoughts

1. "No. No, Cap, asking it doesn't work." *(Angels Fear,* page 87) But the trainer does give the dolphin those extra fish. (See Gregory Bateson, "Observations of a Cetacean Community," in Joan McIntyre, assembler, *Mind in the Waters,* Charles Scribner's Sons, New York, and Sierra Club Books, San Francisco, 1974, pages 146-165, especially page 162.) I take it that the extra fish are of the same order of experience as having to say out loud "I love you."

2. Mary Catherine Bateson's speculations about human language, subjects, predicates, and hands *(Angels Fear,* page 189) remind me of a sentence I wrote in my journal the day after I heard John Lilly talk on PBS about his preference for dolphin ethics and dolphin philosophy over human ethics and philosophy:

DOLPHINS HAVE NO HANDS.

Having no hands, they have not been able to change the world around them, so perhaps the effort that human beings have put into civilization and the "taming" of the natural world has been put by dolphins into changing themselves. If something is amiss, the human urge has been to fix something *else,* not oneself. This is a lot more difficult if you have no hands to do the fixing, so when something is amiss in the dolphin world (inappropriate, maladjusted, diseased, pathological, or even merely inconvenient) do dolphins "fix" themselves instead? Are dolphins (and Zen masters, of course) this planet's pinnacles of my third kind of "usefulness"? Might dolphin language provide a contrasting mode of communication to set up against the subject/predicate structure of human language?

Another Addendum: Religion

Angels Fear covers all the important bases for me: why I don't have anything to do with organized religion (because it forbids questions); why nevertheless I can't avoid the idea that there is something important about the spiritual or the sacred (because I am fundamentally a truthseeker and can't get away from the quest for unity); and why friends of mine whose values I otherwise agree with almost totally (including a Jesuit priest) are still "religious" in the usual sense of the word (because they value their grounding in a "multiplicity of relations" more than what I call truthseeking).

Some of the thinking I've included above about personal change, societal change, and value systems has been influenced over the years by various oriental traditions. Two particularly helpful books have been these: *Meditation in Action,* by Chögyam Trungpa, Shambala Publications, Berkeley, 1969, and *Think on These Things,* by J. Krishnamurti, Harper & Row, New York, 1964. And in the Winter 1985 issue of the quarterly *In Context,* an article by William Prescott titled "Being the Planet" is full of thoughts about how we might go about "getting somewhere," for those who are interested in living, and not just pondering,

some of Gregory Bateson's ideas. (I recommend *In Context* highly in its own right. It calls itself "a journal of humane sustainable culture," and I think many people who have been contributing to *CC* might enjoy it. Subscriptions are $16 per year, from *In Context,* 13.0. Box 2107, Sequim, WA 98382; back issues are also available.)

Thanks for listening,   Janie

Black Racing Stripe

By Elisabeth H. Thomas (1311 Prospect Ave., Brooklyn, NY 11218). Copyright 1987 by Elisabeth H. Thomas.

One of my brother's bunkmates at summer camp used to talk in his sleep, much to the delight of the other boys. Dave says that most of these utterances were incoherent—mysterious mutterings muffled by bedclothes, like Delphian oracles swathed in bad verse. One night, however, the boy wailed clearly in plaintive frustration: "But you *can't* put a black racing stripe on a black *car!"*

I read through *Angels Fear* feeling recurrent fatigue and frustration, my thoughts racing in exhausting circles. In the past, I have delighted in Gregory Bateson's elegant analyses of circumscribed topics. I have especially enjoyed his separate essays, integrated in *Steps to an Ecology of Mind;* they have a refreshing, astringent effect on my thinking—rather like a mental alcohol bath. But *Angels Fear* suggests that Bateson drove himself to his grave trying to use his high-performance intellect to manage the heavy chores of daily intuition—trying to haul groceries, bicycles, and the Christmas tree in a finicky racing car instead of a station wagon.

Bateson's great achievement was his creation of a meta-science adequate to expose fatal flaws in the behavioral sciences. In so doing, he repeatedly suggested that conscious, intellectual thinking is inadequate for understanding life, or "the pattern which connects"—worse, that it actually precludes such understanding. He was particularly fond of quoting the French aphorism *le coeur a saes raisons dont la raison ne connait point* (the heart has its reasons, of which reason knows nothing).

In *Angels Fear,* he and daughter Mary Catherine Bateson approach the subject of sacredness with staggering intellectual insight; yet Gregory's adherence to an intellectual route diverts readers from an intuitive route—the very pathway he stressed as critical for personal and planetary survival. Further, he seems to have stifled his own intuition, for most of his life—through relentless intellectualism. This may explain his late, great urgency in pursuing intellectually—reasons for the dearth of sacred experience in his fellow Westerners.

> DAUGHTER: ... But you can't stop people from trying to count double binds. This business of breaking up process into entities is pretty fundamental to human perception. Maybe correcting for it will turn out to be part of what religion is all about. But you became so grumpy about it, and rather nasty to people who admired you immensely. FATHER: I kept trying to get people to think straight, Cap, to clean up their premises. *(Angels Fear,* page 204)

The above passage reveals both Gregory's frustration with his own pedagogic approach and Mary Catherine's corrective influence on her late father. It also shows her compassionate love for him and her pain over the way he alienated his admirers. The spirituality that does emerge from *Angels Fear* comes mostly from Mary Catherine's courageous generosity in allowing the reader to share in her love. Her brave, graceful display of deep feeling is precisely what gives meaning to his ideologic, often

arrogant obsession with "muddled thought." Clearly, she inherited her father's intelligence and rivals him in intellectual skill. But he was handicapped by lacking her strong intuitive skill.

Throughout his work, Gregory Bateson emphasized the limitations of conscious thought and the importance of intuition—as practiced through poetry, music, and even drunkenness. Yet he kept using conscious ideology to try to eliminate—not just to identify—perceptual errors inherent to conscious process. Paradoxically, he thus reinforced both his own and others' reliance on distortive intellectualism.

His anecdote about Judge MacBride and the Governor's Prayer Breakfast (pages 71-76 of *Angels Fear)* is an example of this paradox. Bateson sees the necessity for non-conscious or "unaware" cognition in spiritual and religious experience; yet he fails to see the futility of trying to teach a lesson that must be lived. He says (page 76): "... I wanted the point to remain implicit—not to be said in so many words and perhaps killed by the many words—but implicit in the setting of the stories side by side." He might as well have said: "I consciously wanted to get the point across unconsciously."

Again (page 76), he acknowledges: "If the Ancient Mariner had said to himself, 'I know how to get rid of the guilt of killing the Albatross: I will go back to the tropics and find some sea snakes, and I will bless them by moonlight,' the Albatross would have stayed hanging on his neck to this day." Yet Gregory's albatross of frustration, depression, compulsive smoking, and cancer hung on his own neck until his death.

In the metalogue that follows this section ("Secrets"), Mary Catherine aptly chastises him:

> DAUGHTER: Ah, but if the story is a story about violations of fine distinctions in human communication, you're guilty yourself. That poor judge! Whether purposefully or not, you set him up on that photography business... (page 83)

Violations of fine distinction riddle Gregory's arguments throughout *Angels* Fear—much more so than in *Steps to an Ecology of Mind* or *Mind and Nature.* This is clearly not due to his daughter's editing; rather, he appears increasingly to have lost track of the utility and limitations of his own meta-science. He originally developed his system of thought to expose damaging premises in the social sciences and Western educational philosophy. To this end, his epistemology is successful; it remains a sharp, versatile tool for critical analysis of intellectual paradigms. However, he transgresses his own epistemology when he tries to use it as a transcendent, corrective ideology—as "Epistemology" with a capital "E" (page 124). Here, he crosses the line between formalism and dogmatism. Mary Catherine points out that a central theme of her father's work is the notion of "knowledge as artifact" (page 184); yet Gregory grandiosely proposes development—within the next 20 years, no less—of an "Epistemology" which "shall be that tautology onto which the empirical *facts* can be mapped" (italics mine). He seems almost to suggest that his ideology could be elaborated enough to pin down, once and for all, this elusive butterfly called "life." Admittedly, he restricts the fields of inquiry to "genetics, morphogenesis, and learning"; but "learning" involves concepts such as "motivation" and "effort" that cannot possibly yield to logical analysis.

He likewise violates his premises with his conscious pedagogy. He kept presuming that he, a mere person among people, could "clean up" the thought patterns of the entire Western world—never mind that only a handful of intellectuals can even begin to follow his theories. Extremely bright members of Esalen's permanent staff still admit that they could never understand "what Bateson was talking about." His presumption that he could exert such influence over his fellow humans was a confusion of logical types, at best; at worst, it represented the tragic

hubris responsible for his years of depression and illness.

In the "Secrets" metalogue, Mary Catherine alludes to her father's dangerous faith in another distortive tool of conscious thought. She rightly concludes that conscious induction—rather than intuitive recognition of true metaphor—mistakenly led him to include the Adji Darma story in the section on sacred secrets. This argument is worth examining in detail.

> DAUGHTER:... I don't think the Adji Darma story fits into this chapter at all. You just like telling it... I'm sure you're right that the theme of the importance of keeping a secret pervades mythology from all sorts of cultures, but that's a funny example to pick... there is something else bothering me here, and that's this business of *secrecy.* I feel certain that you've just gotten it all wrong. Next thing we know, you'll be writing press releases for the Pentagon... you need a different word, you know, maybe *unknowing* or *mystery,* preferably a word that would highlight the fact that a lack of self-consciousness is right in the center of this business of noncommunication. (pages 83-86)

She has the character of her father defend himself, thus (page 86):

> FATHER: Secrecy was something I found in common among the various stories...
>
> DAUGHTER: Induction!
>
> FATHER: Hush...

Significantly, Adji Darma's mistake was not in "failing" to "conceal the fact *that there is* a *secret"* (page 80), but in foolishly trying this very tactic—despite his wife's astute perception of the secret's existence.

To be sure, Mrs. Adji Darma staked her life on successful blackmail of her husband; she tried to squeeze him into spilling the tantalizing contents of his secret. This explains his euphoric relief from guilt, on recognizing the nanny goat's identical blackmail of the billy goat. (It may also explain Gregory's male-chauvinistic delight with the story.) In any case, Adji Darma's secret knowledge was not sacred, it was exploitative. But, if he had had the billy goat's wisdom, he could have eased his wife's distress—while guarding his secret—by giving her a nonsensical answer to her prying. The billy goat's response "Baaa, baaa" constitutes the admission: "Of course you're right; I do have a secret. But I'm not going to tell you what it is."

Gregory's hint that Adji Darma should have elaborated the layers of his deceit exemplifies Western society's exploitative ethic—an ethic that he decried. Deceit is the worm in the apple of consciousness. It lives in the center of hypocrisy and schizophrenia, and led to the death of Adji Darma's wife.

Contradictions in Gregory Bateson's personal life also emerge between the lines of *Angels Fear.* In the metalogue "Why Placebos?" Mary Catherine has the "father" recount events that Gregory did talk about, during his life. The "father" somewhat smugly relates how, during his last hospitalization, he gave "unofficial bedside seminars" on the follies of Western medicine—to the very medical personnel whose aid he desperately had enlisted. Mary Catherine's editorial comment on this hypocrisy emerges in the dry words of the "daughter" (page 67):

> DAUGHTER: So you told all this to a large number of people right out of Establishment medicine. They must have loved you.

In the following chapter ("Let Not Thy Left Hand Know"), another profound contradiction surfaces. Gregory relates how he took LSD, under the supervision of psychologist Joe Adams,

in order to gain "insight into the aesthetic organization of behavior"—not, unfortunately, to get high. He smugly goes on to describe how he managed to turn this potentially rich sensory experience into an opportunity to defend "the intellectual position." He notes (page 70):

> Evidently there is a problem, not simply to avoid thought and the use of the intellect because it is sometimes bad for spontaneity of feeling, but to map out what *sorts* of thought are bad for spontaneity, and what sorts of thought are the very stuff of which spontaneity is made.

Evidently there is a problem, in that Gregory Bateson couldn't tell he was chasing his own tailpipe around the racetrack. He wanted not to dare experiment with avoiding thought, but merely to think hard about the probable advantage of avoiding thought. He wanted to find *a* formula for "spontaneity." This is "the intellectual position."

He apparently allowed himself no strong feelings during this LSD trip—or during daily life. He admits (page 70) that he complained to Joe Adams: "What I see is only the planes of fracture, not the stuff itself." Indeed, the "planes of fracture," the trivial abstractions, are all that the intellect can show us. "The stuff itself" is immediate emotional and sensory experience—not dry artifacts of such experience, painstakingly excavated with intellectual shovels. "The stuff itself" is Mary Catherine Bateson's touching emotional candor in prefacing *Angels Fear* with Shakespeare's poetry ("Full fathom five thy father lies; / Of his bones are coral made...").

I find myself wishing that Mary Catherine had left blank every page but that prefacing one, perhaps daring to add: "Learn Zen meditation!" ostensibly as her father's posthumous command to us all. "Teach T'ai Chi in the public schools!" might have done just as well. The rest of the book could then serve nicely as a diary, where the diligent student could record ensuing spiritual revelations. Surely, what the Western world needs is not Gregory Bateson's black racing stripe of "Epistemology" on the black car of conscious thought; rather, most of us need ways to reach our own souls.

Toward the end of the book, Gregory quotes two limericks and ventures some tragically naive generalizations about "contemporary human beings." Apparently, he was unaware that his personal perspective is neither universal nor inevitable (page 168):

> ... you still have the illusion that if only you could reach the next order of freedom, if only you could stand off in another dimension, you would have true free will. Freedom is always imagined to be round the next corner or over the next crest of the mental landscape. We go on doing research and thinking about all sorts of problems, as if we could one day reach the thought that would set us free.

Freedom from the traps of conscious thought can never be found through conscious thought. But, meditative practices are undeniably "another dimension" from thought. Through meditation, I can usually escape my frustrations and despair—as long as I am willing to relinquish my own intellectual arrogance. For me, this yielding discipline does offer "the next order of freedom."

From *The Ruba'iyat of Omar Khayyam*, translated by Peter Avery and John Heath Stubbs, Penguin Books, 1981:

#196
What have you to do with Being, friend,
And empty opinions about the notion of mind and spirit?
Joyfully live and let the world pass happily,
The beginning of the matter was not arranged with you in mind.

#191
My mind has never lacked learning,
Few mysteries remain unconned;
I have meditated for seventy-two years night and day,
To learn that nothing has been learned at all.

#12
Those who dominated the circle of learning and culture—
hi the company of the perfect became lamps among their peers;
By daylight they could not escape from the darkness,
So they told a fable, and went to sleep.

#199
The dead are changed into earth and dust,
Each particle separated from the others;
Ah what is this wine they have drunk that till the Day of Doom
They have lost consciousness and knowledge of all things?

Firetower, Full Moon, *Angels Fear*

By Greg Bechle (General Delivery, Stevensville, MT 59870). Copyright 1987 by Greg Bechle.

A fire sighs in the woodstove of an abandoned firetower in Idaho's Selway Wilderness. The mountains here look savage and are difficult to penetrate. In three directions I can see for 100 miles, and can see no lights. To the east, a deep valley and a massive wall of rock. The fire whispers, as does the wind. A good place to think about a book about angels.

The wind says, "Greg, this wilderness, what is it?"

And I say, "I don't know exactly, but it has something to do with that lake where I caught only cutthroat trout. They are so pretty. Like brook trout, but their throats are scarlet, and on their bellies the color of sunset."

"Oh yes, isn't sunset tonight beautiful," says the fire. "The sky black to robin's-egg blue to turquoise to the orange of a campfire. The clouds ruddy red with black, the peaks to the south, granite waves in a hurricane."

And the wind says, "That reminds me of the time I spent with Thich Nhat Han. He is such a gentle Zen master, and there is a profound sense of both dignity and sorrow in him. During the practice period we learned, as best we could, about the fundamental unity of mind and body, as well as the unity of mind and nature. And as we sat or walked through the trees, I got the smallest glimpse of what the sacred might be, and of why it is important."

Thich Nhat Han has worked for many many years with boat people, refugees in the South China Sea. Many have drowned in storms. But if one person can stay calm during the storm, the boat has a better chance to survive it. While we were at the Providence Zen Center learning about this, a hurricane was coming up the coast, heading right towards us. Normally I would have felt fear, but inspired by someone who knew that the religious path was a reality, I wrote this poem.

I'm happy to be a hurricane
I'm like a flower, or a
Seashell curled around itself
On the ocean floor.
And set in motion by the sun,
Once again I spin.
My center is calm
The rest of me is like galaxies in space
Spinning, appearing, then disappearing.

Someday I will become a galaxy.
 My water droplets are suns
And around them are planets.
And on the planets live beings
Listening to the hurricane.
Once again at the sound of the bell,
They return also to their center,
Then like me they laugh,
And spin again.

"Hmmm... metaphors of grass, as a type of corrective. The poetic, the religious... I can't remember exactly... something from *Steps to an Ecology of Mind*, but as the moonlight washes the peaks and I listen to you guys talk, I keep coming back to something Gregory Bateson said, something like: rational human thought divorced from dream, art, religion, is necessarily pathogenic and destructive of life, because life depends upon vast interlocking circuits of contingency, while rational mind can only see so far as purpose can direct.

"Anyway, guys, that's the gist of it. There is really something to this, worthy of an essay, another essay, and I think that this idea is also at the core of *Angels Fear.* On page 200, Mary Catherine Bateson sums it up:

> [Gregory Bateson] suggests that certainly through human history, and perhaps necessarily into the future, religion has been the only kind of cognitive system that could provide a model for the *integration* and *complexity* of the natural world, because these are the characteristics that most persistently elude even the most meticulous efforts to describe.

"Well, there has to be something to that, and when I listen to Hildegard of Bingen's music, or read the old Zen masters, that is a good hunk of what they are saying. "Good religion" can open us up to the beauty and diversity of the natural world. I think of the words of the conservationist and naturalist Aldo Leopold."

> A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise. ("The Land Ethic")

Control Theory and Cybernetics

By William T. Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1987 by William T. Powers.

In recent *CCs,* there have been some self-promoting complaints about how unaesthetic we control theorists are. From the receiving end, this is something like getting an obscene phone call: it's hard to think of it as a conversation. Well, I won't put up much of a defense. There *are* some dull spots to get through on the way to understanding control theory, and a control theorist would be the last person to say anyone *has* to like control theory, or understand it. On the other hand, if you don't understand control theory, isn't it a little unwise to write thousands of words

about what you imagine it to be? I would think that the potential for embarrassment would be reason for caution.

The control theorist isn't trying to reduce human beings to machines, or trying to draw clever analogies between human activities and those of Rube Goldberg (or Bucky Fuller or Department of Defense) artifacts. Instead, he or she is trying to make a start on understanding human nature and the nature of organisms in general in some useful way. This has never been done before. Perhaps some cyberneticists, despite their assessment of the state of the world, don't like to hear statements like that. I can assure you that conventional behavioral scientists don't like to hear them, either. Control theorists have had just as hard a time with conventional behavioral scientists as they seem to be having with certain cyberneticists, and for similar reasons: the opposition is arguing against something they haven't taken the trouble to understand.

Behavioral scientists like to discount the successes of physics and engineering by saying that the hard scientists have it easy: they work with reproducible phenomena and simple material objects, whereas students of living systems face immense complexity and variability that call for a different approach. Basically, that is hogwash. If organisms are so complicated (and certainly they are), why is it that the analyses of their behavior offered by behavioral scientists are so utterly simple? Most explanations of behavior can be reduced to the statement "Behavior B is caused by stimulus, situation, cognition, or property A." Now compare that kind of analysis with the kind a physics student struggles to understand while learning to predict the behavior of a simple piece of matter, a spinning gyroscope. Is it easier to get an "A" in Physics 301 or in Psychology 301?

The reason that the behavioral sciences have had so little success is twofold: first, the aim is wrong, and second, the model is wrong. The avowed aim of behavioral science, in many quarters, is the "prediction and control of behavior." This goal makes sense only in terms of a model that describes behavior as an effect of external causes (and not of goals). If the scientist can study external causes and the behaviors they generate, it follows from this model that by observing or predicting new circumstances, the scientist can predict new behavior. And most important, by manipulating those circumstances, the scientist can control behavior.

Control theory shows that the cause-effect model is wrong, and therefore that the goal of predicting and controlling behavior is trivial, futile, or self-defeating. For a lot of detailed reasons that I won't go into here, because they are somewhat dull and space is limited, the control theorist understands behavior as the process by which organisms control the worlds they experience. The standards around which this control process is organized are inside the organisms, not outside them. Control systems in organisms take on specific forms through interactions with the world outside, but they also reflect inborn organization that can't be traced to any event or cause in the lifetime of a single organism. There are basic goals, intentions, standards—we call them "intrinsic reference signals" to get away from old meanings and to distinguish them from learned goals—that define for us what it is to be human: that tell us that we will find experiences pleasant or painful, aesthetic or ugly, orderly or chaotic. At the lowest levels, intrinsic reference signals determine what pH will be maintained in the bloodstream, what temperature in the brain-stem, what level of lactic acid concentration in the muscles. The lowest known level in the intrinsic hierarchy seems to be found in the repair enzymes that are made by and act upon DNA. At the highest levels, intrinsic reference signals perhaps set the very terms in which we make human value judgements: the dimensions along which we judge, rather than the specific judgements.

In service of these fundamental standards or reference signals, we acquire through experience a hierarchy of behavioral control systems. These control systems exist, in an adult, at many levels,

and in multitudes at any given level. They all operate at the same time, sometimes consciously but most often not. A few of these levels deal with symbol manipulations, but there are levels both higher and lower than these "rational" (meaning, mostly, verbal) levels. The higher levels operate by adjusting the goals of the lower levels, the lowest level in the behavioral hierarchy being the spinal "reflexes," and the highest I can think of, for the moment, being concerned with system concepts like self, society, science, and art (to name a few). The control system model thus sketches in the necessary steps of translating thought into action and vice versa.

That is, very roughly, how the control system model of behavioral organization is put together. Behind this model there is something called control theory. Control theory does not consist of the statement that organisms are control systems—that statement proposes only that certain relationships will be seen in behavior; if they are seen, the behavior is indisputably that of a control system. Control theory is the method of analysis that lets us understand and predict the behavior of any system in this kind of closed-loop relationship with an environment: basically, it's a body of mathematical analysis. In that respect, it's like Von Foerster's attempts to represent behavior in terms of recursive functions and eigenvalues, or Varela's use of the Spencer Brown calculus with the addition of strokes that go around little squares. The difference between the latter two approaches and the approach using control theory is that control theory actually makes quantitative predictions of real experimental data—very accurate predictions. The other two approaches have yet to predict any specific observable measure of behavior, accurately or otherwise.

From the standpoint of the conventional behavioral scientist, the control theoretic picture amounts to a total repudiation of the conventional concept of what behavior is and how it works. I am puzzled to find that cyberneticists, particularly the ilk inhabiting the pages of *CC*, have not greeted the advent of control theory with cries of joy. Control theory supports many of the objections to conventional science that are apparent in these pages—and slips a scientific foundation under them. Unfortunately, there have been many interpretations of control theory based on half-understood rules of thumb, and many leaps to wrong understandings of what control systems are and how they work, published in the cybernetic literature as well as elsewhere. So the objections directed at control theorists are mainly misdirected: they impute to us things we don't believe, they make wrong deductions from control theory and then object to them, and, if you'll pardon my pique, they sometimes reject what is really a very beautiful and precise concept while substituting a lot of empty holier-than-thou blather for it.

It's not really fair to argue against control theorists by imputing to them the beliefs, aspirations, and philosophical stances of the very sciences they are trying to revolutionize.

The control theorist does not believe that "scientific method" as now used with respect to organisms is worth much. The control theorist is, true enough, concerned with quantitative analysis, but is also vitally concerned with human capacities for perceiving the qualities of experience, from simple intensity to system concepts. Imagination, insight, creativity, and feeling are all part of human nature, and we control theorists try (with varying success) to integrate them into our models. Control theory—real control theory, not that "programmable functions of stochastic machines" junk—probably gives us the best medium for understanding constructivism, for making it real, illustrating its premises, and saving it from solipsism. Control theory is exactly what cybernetics needs. That's not so strange: control theory is exactly what cybernetics was founded on, however many cyberneticists have forgotten that (or never knew it).

Some wise men of the East advocate a life of passive perception: go with the flow. Some wise men of the West advocate a life of blind action: damn the torpedoes. I don't think that the solution to human problems has been carried very far by either group. I hope that cyberneticists (and everyone else) will be able to accept a new approach to human nature that is based on the hard demands of good science, and, even if it offers little that is spectacular right now, will understand that to build a real science that can solve social problems, we must begin at the beginning. The truths of control theory are truths that work with precision, all of the time, admitting no exceptions. If they are simple truths, so be it: so were those that Galileo found by rolling balls down a ramp and timing them with his pulse. If they are provisional and temporary truths—well, name me a truth that isn't both of those things.

Ugliness: A Reply to Yocum, White, and Others

By Tom Bourbon (Department of Psychology, Stephen F. Austin State University, Nacogdoches, TX 75962). Copyright 1987 by Tom Bourbon.

Ugly, ugly, ugly! In their contemptuous assessments of control theory, Yocum *(CC #9)* and White *(CC #10)* demonstrate penchants for that derogative. We brutish control theorists look with wonder and dismay upon the sinister qualities attributed to us by those enlightened gentlemen. Why do we suspect that their eloquent denunciations are misdirected? Why do we believe that, in their supercilious prose, they demonstrate not an appreciation of the aesthetic alongside the pragmatic, as was suggested by Gregory Bateson, but the excesses and affectations which often inflict the aesthete?

How do control theorists characterize the organization and activity of living creatures? What do we say, that some members of the cybernetic community take such offense at our existence and at the presence of our ideas on the pages of *CC*? We say essentially this. All that a creature knows of "the world" is its own perception of the world, never "the world itself." The actions of a creature are one influence, among many, on that worldneverseendirectly: the state of the world in the vicinity of a creature is influenced by the creature, as well as by other sources. The worldneverseendirectly influences, or perturbs, but does not cause, the perceptions of a creature. By its actions on the world, a creature creates, changes, eliminates, or maintains the contents of its perceptions. Whether with subjective awareness, without it, or both, a creature "knows" if its perceptions are satisfactory, or not, only by way of comparing present perceptions with a "standard," or "reference." A creature acts to create or maintain perceptions that match the reference, and to eliminate or avoid those that do not. On this construal of life, control theorists assert that it is impossible for one creature to control the behavior of another. Control theory is not about "how to gain control over a creature." Neither is it about how either an organism, or an environment, unilaterally controls the other.

Perhaps some are offended by our attempt to formalize those principles in a mathematical model which enables us to test for the adequacy of our understanding of an instance in which we believe the principles might apply. Apparently, many cyberneticians believe control theory imposes a machine metaphor on living systems, but control theory asserts that the analogy runs the opposite way: artificial control devices were created by people only because the behavior of people relates to their environments in such ways that one can easily identify aspects of the environments which are clearly under the control of people. That is to say, people determine that certain features of their environment are brought to and maintained in particular states, and are defended against the occurrence of other states. The regularity with which people act in this manner readily

lends itself to quantitative modeling and to partial instantiation in artificial control devices.

No vantage point is privileged, not even one which claims superiority due to its heightened aesthetic sensitivity. The "natural relationships" held dear by extreme aesthetes in cybernetics are as much creations of perception as are the substances and forces described in science and applied in engineering. Neither position affords a direct view of the world. Perhaps I missed something, but didn't Bateson make just that significant point? Apparently I am not alone in that impression, for I once saw it stated, persuasively, in a manuscript by Morris Taggart, a therapist and scholar affiliated with the Houston-Galveston Family Institute. Taggart argued that the "call to aesthetics" in family therapy was not a call to abandon, or to denigrate, pragmatics, or praxis, but a call to appreciate the wider, aesthetic, domain that surrounds and nurtures praxis. Or did Bateson indeed urge the narrow and contrived distinctions trumpeted by contemporary defenders of aesthetic purity in cybernetics? In many of their comments, Yocum and White offer distorted interpretations of control theory, and of science in general. The errors are too numerous (and often too contrived) to address comprehensively, but a few deserve mention:

1. Control theorists do not posit "control systems in the brain," but we do conceive of neurons, throughout the nervous system, as "comparators." That is to say, we accept the interpretation of neuronal activity as reflecting the net result of all excitatory and inhibitory influences on each neuron. On this construal, most all of an organism functions as a control system. Control theorists should not be characterized as offering yet another version of a "demon" in the heart, liver, brain, or any other of the cute, but inappropriate, examples employed, *ad nauseam*, by Yocum and White. I trust that those gentlemen are consistent in their rejection of all of contemporary science and technology and that they do not simply reject control theory. They must feel the same repugnance over modern agriculture (think of the demons and spirits worshipped by early farmers), medicine (a history of bleeding, humours, and the like), engineering (a reliance on physics, and heaven only knows all of the fanciful interpretations of the *physis* employed by physicists in times gone by... earth, air, and all the rest), and chemistry (alchemy and all that rot). No consistent aesthete should, in good conscience, use a telephone, computer, antibiotic, set of eyeglasses, airplane, bridge, elevator, surgical procedure, or food product. Rather, she or he should heap scorn and ridicule on all who practice to create those evil artifices.

2. Control theorists employ their model of behavior only if they can identify a "controlled quantity"—a variable demonstrably under the "control" of a creature. Absent such a controlled quantity, application of the model is not warranted.

3. "Evolution" does not "act with purpose": It does not "act" at all. Neither does it "select" or "create." Evolution certainly did not create two classes of life called aesthetes and control theorists, as apparently thought by White. Rather, people adopt many intellectual positions, including at least those two, and those two are not of necessity disjoint.

4. Thermostats do not control temperature. People are not thermostats. Forget Wiener and look at what control theorists say.

5. "Autopoiesis" is a fascinating word, suggesting an important construal of organisms and environments, but invocation of that word explains nothing and reveals no superior moral, intellectual or aesthetic position. Invocation of the word ("The Word"?) often is used as a substitute for thinking and a justification for rejecting "evil" science, out of hand. (As employed by some aesthetes, "autopoiesis" is an outstanding example of Bateson's "dormitive principles.")

6. The uncertainty principle, applicable in quantum mechanics and quantum electrodynamics, should not be casually introduced into discourse at other levels of analysis in physi-

cal systems, especially not as a justification for sloppiness, or for focusing on the wrong variables, in the behavioral and life sciences.

7. Who does *not* agree with the bromide, "The map is not the territory"? But the ease with which that phrase is tossed about by some aesthetes reduces it to the banal and suggests that they view maps with suspicion or contempt. Those attitudes are "appropriate" only for one who never found herself or himself in the midst of trackless sky, sea, or desert, where survival depended on the accuracy of a map. All maps are not created equal; some, which are aesthetically exciting and fanciful, are no damned good for navigation.

In their apparent eagerness to denigrate control theory, White, Yocum, and some others often descend to unkind portrayals or to nasty personal insult. Thus, Hyland *(CC #9)* speaks of Bill Powers as a mere maker of paintbrushes, whose work is inferior to that of a painter of masterpieces (by implication, Hyland would be such a master) and who should never even try to paint. Interspersed with his frequently specious portrayals of control theory, Yocum *(CC #9)* discharges one barrage of aesthetic scattershot after another in the direction of the theory and its students. He asks, cutely, whether Powers really knows the distinctions whereof he speaks. And he reaches his true aesthetic level when he suggests that control theorists spend too much time tinkering with hardware and implies that, as a consequence, they might not recognize a living system if they saw one. Hence, his suggestion that we all go peek under a rock. (Incidentally, I know a few rocks under which one can view some fascinating creatures, but to reach them, one not familiar with the desert territory must rely on a map. Alas, many aesthetes will never see those places!) Could Yocum's remarks possibly be a fair representation of Bateson's views? If so, I must seriously rethink my earlier readings of Bateson.

For his part, White *(CC #10)* portrays control theorists as endowed with lecterns in "great American universities," which surely comes as news to us, since nearly all control theorists are either "private investigators" or faculty in obscure universities and colleges, and none of us is supported directly for work on the theory. Further, White paints us as "petty bourgeois organisms" who should leave him and the rest of the living world alone. (Consternation, gentlemen! Should we obey White, and leave life alone, or Yocum, who enjoins us to stick our noses under rocks? Can't you aesthetes agree on so basic a point as that?) White then labels control theorists as a fallen form of life, bereft of redeeming qualities and bent, albeit unwittingly (because they are witless), upon the destruction of all that is beautiful and sacred. What is worse, this repulsive lower form of life now dares to read (and contribute to) *Continuing the Conversation.*

Gentlemen, gentlemen! Next, you will question our taste in art, literature and music! And you will wonder, in print, about our table manners! Such exercises in aestheticism are more suited for journals of criticism in art and literature, where one's only recourse is to one's cleverness with words and one's "power" and "prestige," whatever those might be. But I suspect you would argue that science is no different from those forms of criticism, even though, as a social institution, science was developed specifically to mitigate the influence of "bombastic egoism, or hubris," as evident in your disdainful assaults on control theory and its students. If we are to engage in a conversation, in which all participants might enlarge their understandings of the thoughts and sensitivities of the others, then each of us must acknowledge that the others are possessed of at least a modicum of humanity. Absent that attribution, we can only expect the larger world to deem cyberneticians a mean and trivial lot—effete to the core. And the characterization would be fair.

A Further Note on
the Smithian Economics

By W.D. Williams (1850 Norwood, Boulder, CO 80302). Copyright 1987 by W.D. Williams.

In Michael Aitken's response *(CC* #9) to my initial note on the Smithian economics *(CC* #8), he uses his own experience in developing an autonomous life style to point to an additional inadequacy in conventional economics. What Aitken perceives as a crucial inadequacy of the conventional view is usually thought to be one of its strengths. The problem of describing how to structure a reasonable society without detailed governmental supervision of the population was one that Smith thought he had solved with his conception of a system of simple and obvious natural liberties. However, the difficulties contained in Smith's conception are so impressive that the critics of conventional economics rarely consider whether his psychological model presents an adequate internal description of an autonomous person's functioning. The sort of critique which Aitken develops is left to those outside economics.

Because control theory appears to be a construct that is capable of coping with such complexity, it seems to me to be a good candidate for a replacement of Smith's conception. In my earlier note, I used the Giffen effect as an illustration of how control theory can be employed in economics. A report in a recent issue of the *Journal of Experimental Psychology* (1) provides an opportunity to extend that illustration. It describes experiments which produce the Giffen effect in monkeys whose diet consisted of two foods, one (the non-Giffen good) preferred to the other (the Giffen good). The effect demonstrated was not as pronounced as the experimenters might have wished. A control theory analysis of the Giffen effect suggests a way to strengthen the effect of a price increase for the Giffen good, namely by reducing the price of the non-Giffen good, as shown in the accompanying figure. When the price of the Giffen good is raised, the Giffen effect appears as an *increase* in the amount of the Giffen good consumed (GH - GL) and as a *decrease* in the amount of the non-Giffen good consumed (NL - NH). The effect is greater with a low-priced non-Giffen good (budgets 1 and 2 in the illustration) than with a high-priced non-Giffen good (budgets 3 and 4). Economists using the Smithian psychological conception do not appear to be in a position to make such predictions.

My thanks to Greg Williams, who brought the paper by Silberberg, Warren-Boulton, and Asano to my attention.

Reference

1. Alan Silberberg, Frederick R. Warren-Boulton, and Toshio Asano, "Inferior-Good and Giffen-Good Effects in Monkey Choice Behavior," *Journal of Experimental Psychology: Animal Behavior Processes* 13(3), July 1987, 292-301.
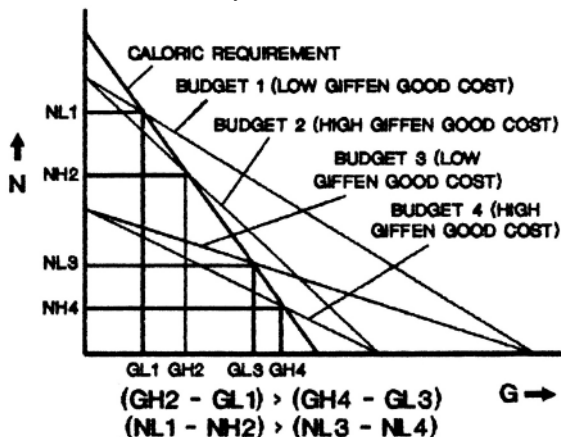
Comments on
"Three Conceptions
of Conversation"

By James E. Brassert (Postfach 1265, D-7400 Tübingen, German Federal Republic). Copyright 1987 by James E. Brassert.

Stuart Umpleby informs us in *CC* #10 that he has found himself "reflecting on the different assumptions that cyberneticians make about how to conduct a conversation." He himself prefers to hold that conversation is an art. The American Society for Cybernetics, he opines, is a "social system," such a "system" being a collection of groups using different points of view. These groups may, if I understand Stuart correctly, use different assumptions and sets of assumptions, and they may also use different assumptions and sets of assumptions as reference assumptions and reference sets. And furthermore they may use different conceptions or preconceptions which have the status of assumptions, or different assumptions which have the status of conceptions, as reference conceptions. The American Society of Cybernetics is such a collection of groups as has just been mentioned, and Stuart views this collection as containing within itself a "realist" group, a "constructivist" group, and a group which, if I understand him correctly, holds a "social system" to be a collection of groups which contains within itself such groups and leaves some room for the generation of other groups, and in comporting itself thus, takes the standpoint of the "system." And, as I should not forget to say, it leaves room for interaction between the groups.

Stuart appears decidedly of the opinion that the conduct of the "constructivists" is such that a boundary is maintained and a "conversation among those devoted to a particular set of ideas can continue." It is not clear to me why he could have any objection to this on the basis of his view of a social "system." Rather, it would be clearer to me if he had stated that such conduct is consistent with his own conception, so long as such boundaries do not prevent exchanges and linkages across them, and so long as such exchanges do not disrupt the conversations continuing in and among a plurality of groups. It appears central to his argument that "one way both to 'continue the conversation' and to advance cybernetics is to share our different assumptions about the art of conversation."

But would this be an attenuated "sharing" if at the same time members and groups of members of the Society are in conflict with one another with regard to such assumptions as he might prefer them to share? He suggests that "by putting on the same panel people who use very different assumptions, the discussion tends to draw out these different assumptions." Could this mean something else than that the conversations and meetings are planned more appropriately, for the purpose he has in mind for the Society, when they are planned at least to draw out conflicts and transform latent or potential conflicts into overt and actual conflicts, if not still more directly to provoke them? For he says: "The intention is to use conflict to reveal unstated beliefs and to discover the limits on any system of ideas. Each set of ideas is usually quite effective at dealing with some questions, but not particularly effective at dealing with other questions. If a society is regarded as a collection of points of view, then understanding the usefulness and the limitations of each point of view becomes a key concern."

I agree with him that such understanding is *consistent* with his view of a social system and of the American Society for Cybernetics as such a social system, as has been mentioned. But since he introduces such understanding as a "key concern," the question arises whether he is not asking us to go at least a stage further in explicating characteristic implications of this Society, or particular implications of any society of such character that

an art of conversation is not separable from an appropriate way of explicating it. A human society would appear to be of such character.

Now it may be that with our joint efforts and a shared wish to do so, we may arrive at a conception of cybernetics which is peculiarly, if not uniquely, appropriate for the explication of characteristics of a human society from which we consider an art of conversation to be inseparable. At this point, it seems to me, a conflict *might* arise between "constructivists" and those who hold the above to be a minimum task of the Society. The latter might hold that a conception of cybernetics, as capable of being more generally used, is the minimum task of this Society because it is the first task, the accomplishment of which is a condition of the probability that the work of this Society of ours might prove fruitful for any other. And since it would seem to be hard to deny that it is an *appropriate* task, the more difficult question might be raised whether the chances of accomplishing it might not be improved if they were linked up with chances of a cybernetic conception of an art of conversation. To be sure, it may also be the case that some "constructivists" believe that "constructivism" is an *implication* of a conception of cybernetics, but an "art of conversation" is not. Furthermore, feeling competent in the regions where the language of "constructivism" is used, some may not wish a conflict to be drawn out; these may not cooperate with Stuart in his effort to do that. They may feel it would give them the appearance of a defect in the eyes of other members of the Society (and others the appearance of a virtue) while also feeling themselves to have more understanding of the hurdles that have to be surmounted, if an intention which they may be willing to respect is to have effects relevant for life chances in a larger society of which we are also members.

Furthermore, would we, in drawing out the conflicts, or if not these, then some of the issues, be putting ourselves too much at the mercy of those argumentative weapons of criticism and those critical competences, the employment of which is in fashion again today?

I do want to agree with Stuart, and I would like his help in putting me in a position to agree with him. But do we have to have a fixing of the critical line? The very *justifications* put forth in favor of it by Socrates—and they are perhaps still the strongest—appear to me so weak, if not with regard to the notions toward which the critic's intention is directed, then by consideration of the motivation behind it, and not least of all of its effects. In such conversation do the motivations toward joint reflective activity and cooperative activity get *their* fair chance? Do requirements of projective energy discharge and a misguided manner of energy control perhaps frequently get more chances? Perhaps the space taken up by such facilities of energy discharge and energy control on the demand and supply schedules of social economies deserve some of our attention. My impression is there is plenty of critical problem resolution capability on the supply schedules, and plenty of unobjectified demand for change on the demand side, little capable of resisting "channeling" into a demand for such services of "problem-resolution" as critical theorists, here and in America, are able wittingly or unwittingly to supply. A question which may be addressed, I suspect, to Bill Powers or to oneself, is whether the same criticism appears in the same light when we succeed in supplying it to ourselves before others perform this "service" for us, and when we fail in this regard. Is "critical theory" perhaps a surreptitious form of behaviorism? My impression is that the kind of correction and criticism that is apt to work is that which we may be willing and ready to supply to ourselves, where it is a question of our being the outsiders or of participating freely in social undertakings which have relevance for our chances in life. And can we afford to take for granted the notion that our willingness and readiness to supply criticism and correction to a small group or in a social economy, taken as a whole, will be matched, on the demand side, by a willingness and readiness to

receive it, and not rather by a willingness and readiness to generate defenses against it? In such a case, is the situation not often such that the economic waste becomes apparent even while, as a result of our successful efforts at abstractive objectification of our social landscape, some destructive effects on human lives and life-chances are overlooked?

I hope that some day, perhaps as a result of such work as James Buchanan and others have been doing at the University of Virginia, to which Stuart and Larry Richards are closer than I, we may more clearly see our way to objectify a social landscape without at the same time desubjectifying it. In his studies on the generation of culture and identity, Freud carefully distinguished between creative tendencies and their genealogy on one side, and destructive tendencies and their genealogy on the other, so far as he felt the evidence to support him. At the least, his assumptions helped to clarify the differences between them and such interactions as might put the one in the service of the other. Did his clarifications speak in favor of *any* science not put into the service of an art? I would certainly be interested in how Stuart might pursue the further implications of his own suggestion, according to which conversation is an art. Surely there can be a *conception* of an *art.* A question then: could cybernetics, *under the limitation* of its relevance for life, have appropriate reference to such a conception?

It is in this direction that Larry Richards' contribution in *CC* #9 might be seen as especially supportive of Stuart's proposal that we share assumptions about the art of conversation, although the conceptions of society they start with are quite different. What Larry suggests seems to me to be that a society is not correctly understood as all the people who are members of it, nor as a collection of groups, nor as all their interactions with one another, nor merely as a set of institutions imposing rules or "reference signals" for the government and constraint of their relationships, *if* these rules or "reference signals" are not regarded as emergent. Where the historical, emergent view comes into its own, there we are able to discern societies satisfying our criteria for their conception. For there we see emergent constraints on the possible interactions and ways of relating, and even on the ways of establishing rules. *Until* we discern emergent constraints, there may be a painful deficit of relevance of the manner in which a society's activities are understood by some of its members and subgroups of its membership for the life chances of all the membership. Larry's minimal conception of a "society" is that which I have mentioned. But I have the impression that he, also, might be ready to go a stage further and suggest that what may emerge in a society thus conceived is a rather general conviction of the appropriateness of still further criteria, or "reference signals," of fairness and impartiality, capable of being used, at least as reminders, where the relevance of the society for the life chances of all its members is still in question. This statement would seem to be interpretable as supporting the third of Stuart's assumptions, if it is correct that this latter assumption would make possible, even though it would not assure that, in connection with differentiating activity, there were freely integrative activity having acknowledged relevance for the chances of all the membership and perhaps helping to prevent the society from falling apart.

If we wish to make further attempts to use the feed-in coming from so many directions, even possibly coming from all the directions which Stuart mentioned, in an attempt to conceive a human society and our Society of cybernetics in cybernetic terms, then I would also put my bets on the notion of "reference signals," taken both in the above particularization and more generally, as being usable for this purpose. It does not seem easily separable from cybernetics, whether the latter is conceived as an art of conversation, or whether it is conceived as a science.

On the 1987 ASC Meeting

By Larry Richards (Department of Engineering Management, Old Dominion University, Norfolk, VA 23508).

The 1987 Meeting of the American Society for Cybernetics was held at the University of Illinois at Urbana-Champaign, December 2-6, 1987. Some new ideas were introduced to the structure of ASC meetings: a cybernetics cabaret, a cybernetics fair, more workshop-style sessions, fewer parallel sessions, and numerous evenings of entertainment and fun. I experienced some of the finest group discussions, dialogues, and personal conversations in which I have been fortunate enough to participate at any cybernetics conference to date. I attribute this in large part to the attention to detail given to the organization of the meeting, which in my opinion was far greater than at any previous ASC meeting. Since details were attended to, they were not noticed. Rather, the controversies that arose concerned content and styles of interaction; the technical details did not interfere with the surfacing of these cybernetic issues. I believe that one consequence of this attention to detail is that the person who takes on the responsibility for doing it, in this case Mark Enslin, gets more upset when something goes wrong. Personally, I think a certain amount of error is *necessary*, and that mistakes (even failure) are greatly underrated. My congratulations to all those who participated in organizing this conference, and I hope the spirit of experimentation continues into future conferences.

1988 ASC Meetings

June 15-19, 1988, University of Victoria, British Columbia, Canada. Theme: "Intelligent Networks—and Beyond...", cosponsored by the Pacific Region Association for Telematics, with assistance from the Centre for Systems Research, University of Alberta. (The flyer which many ASC members received recently indicates that this is the Silver Anniversary Conference of the ASC. This is incorrect and will be changed in future publicity. The ASC was started in 1964.) Some of the activities planned for the conference include a salmon barbecue, CyberFest at the Provincial Museum (about 7000 people are expected on that Saturday), special evening lectures and performances at the Museum, and opportunities to engage in conversation with many people who have not previously attended an ASC meeting, but who are highly curious about what is going on in cybernetics. A chartered plane may be arranged, which would make stops and pick up people at various locations in the U.S. and Canada. The University of Victoria is providing accommodations. Anyone desiring to give a presentation, lead a workshop, or prepare a paper should send an abstract to: CyberNET '88, Conference Office, University of Victoria, P.O. Box 1700, Victoria, British Columbia, Canada V8W 2Y2. Papers will be electronically posted, and on-line conferencing will be encouraged both before and during the event. For further information, write to the address above or call 604-721-8475. Information on the chartered plane will be available in the near future.

October 1988. A three-to-five day conference on "Texts in Cybernetic Theory" is tentatively planned. We are trying to get space at the Asilomar Conference Center on the Monterey Peninsula in California. The theme and structure of this conference are still being formulated. The current idea is to engage in serious study of selected works by key figures in cybernetics. Each day would be devoted to reading, examining, questioning, and discussing specific texts (which would be distributed ahead of time). The intent is to promote deeper understanding of the major points of view in cybernetics. The final day would engage the authors of these texts in dialogue and discussion of issues that emerged in the previous days. For more information, contact Rodney Donaldson, P.O. Box 957, Ben Lomond, CA 95005, U.S.A. (phone 408-338-9057).

Symposium Announcement

"Consciousness & Reality: The World According to Humberto Maturana," the 11th Annual Young Adult Symposium at the Horsham Clinic, Ambler, Pennsylvania, February 26-27, 1988, will include panel discussions, workshops, presentations, and live interviews with individuals and families. Faculty: Humberto Maturana, Loren Crabtree, Jay Efran, Frank Galuszka, Ken Gurgin, Harvey Horowitz, Sam Kirschner, William Overton, Robert Schoenholtz, Melvin Singer, Fred Steier, Oscar Weiner, and Polly Young-Eisendrath. For more information, contact Leon Crabtree, Horsham Clinic, Ambler, PA 19002.

Control Systems Group 1987 Meeting Tapes

Audio cassettes of presentations and discussions at the third annual meeting of the Control Systems Group are now available. Send a self-addressed stamped envelope for a list of the cassettes and their prices. Also available (for $8.00 postpaid in North America, $10.00 overseas) is a two-hour discussion of the origins and development of control theory ideas in biology, with Bill and Mary Powers, Tom Bourbon, Bill Williams, and Greg Williams. Address all inquiries to Greg Williams, Route 1, Gravel Switch, KY 40328, U.S.A. (phone 606-332-7606).

Control Systems Group membership dues, including subscription to the newsletter *Feedback, are* $10.00 per year ($2.00 for students); send to Ed Ford, 10209 N. 56th St., Scottsdale, AZ 85253. For information on the 1988 CSG meeting, contact Mary Powers, 1138 Whitfield Rd., Northbrook, IL 60062.

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Continuing the Conversation

A Newsletter of
Ideas in Cybernetics

From the Editor

"Cybernetic utility"??? This issue includes several responses to my questions in *CC* #10 about whether the two words can or should be juxtaposed. I had suggested that the notion of the usefulness of cybernetics was "both neglected and controversial." Now it isn't so neglected, but it certainly remains controversial, as the diversity of positions presented below indicates. Of particular interest, at least to myself, is the apparently radical evolution in cyberneticists' valuations of the utility of cybernetics from Norbert Wiener to the present time. Wiener was extremely enthusiastic about applying cybernetic ideas, especially to medicine (but not to weaponry!); some contemporary cyberneticists are much more wary of viewing their field as, in the words of Ranulph Glanville, a "tool kit."

Additional comments on the usefulness of cybernetics are invited for *CC* #13. As usual, contributions related to *other* ideas in cybernetics arc also welcome. The deadline is June 1, 1988.

A Letter

From Heinz von Foerster (1 Eden West Rd., Pescadero, CA 94060). Copyright 1988 by Heinz von Foerster.

2/1/88

Dear Greg,

Instead of another long story about long stories, etc., why don't you publish the stories from the horse's mouth.*

Cheers, Heinz

*Or just the references to the stories from the horse's mouth: as attached.

[Editor's Note: Enclosed with Heinz's letter were several pages from the Table of Contents of P. Masani, editor, *Norbert Wiener: Collected Works with Commentaries, Volume IV, Cybernetics, Science, and Society...*, MIT Press, Cambridge and London, 1985. Listed below are some of the papers in that volume which were noted by Heinz as "stories from the horse's mouth." I have included brief quotes from some of the papers which (in my opinion) help to convey Wiener's views on "cybernetic utility."]

N. Wiener, "Homeostasis in the Individual and Society," *Journal of the Franklin Institute 251,* 1951, 65-68.

N. Wiener, "The Concept of Homeostasis in Medicine," *Transactions & Studies of the College of Physicians of Philadelphia* 20(3), February 1953, 87-93.

N. Wiener, "Problems of Organization," *Bulletin of the Menninger Clinic 17(4),* July 1953, 130-138. "I thus contemplate a new branch of medicine which one may call 'servomedicine' for want of a better word."

N. Wiener and J.P. Schadé, "Introduction to Neurocybernetics," in *Progress in Brain Research,* Elsevier Publishing Co., Amsterdam, 1963, 1-7. "Cybernetics is not only the study of control and communication in man and machine, but also *between* man and machine. There has been a certain attitude against this relation, to be found particularly in some engineering circles which involves the comparison of human performance with machine performance, to the disadvantage of humans... The proper relation between man and machine is not that of competition, but in the development of systems utilizing both human and mechanical abilities."

N. Wiener, "Sound Communication with the Deaf," *Philosophy of Science 16*, 1949, 260-262.

J. Wiesner, N. Wiener, and L. Levine, "Some Problems in Sensory Prosynthesis," *Science 110,* 1949, 512.

N. Wiener, "Problems of Sensory Prothesis," *Bulletin of the American Mathematical Society* 57, 1951, 27-35.

N. Wiener, "Les Machines a Calculer et la Forme (Gestalt)," *Les Machines a Calculer et la Pensee Humaine,* Colloques Internationaux du Centre National de la Recherche Scientifique, Paris, 1953, 461-463.

N. Wiener, Verbal Contribution, *Proceedings of the International Symposium on the Application of Automatic Control in Prosthetics Design,* Opatija, Yugoslavia, 1962, 132-133.

N. Wiener, "Epilogue," in *Progress in Brain Research,* Elsevier Publishing Co., Amsterdam, 1%3, 264-268. "There is no way of learning how to make a watch quite like repairing one... the cybernetic medicine of the future... will not merely consist of the cybernetic medicine of the laboratory, to find out things, but also of the cybernetic medicine of the engineer to repair things. I think that we never would have learned the fundamental basis of electrical engineering, or at least not nearly as much as we have done, if we hadn't had to make and repair apparatus by means of ft. I think this is also true here."

A. Rosenblueth and N. Wiener, "The Role of Models in Science," *Philosophy of Science 12*, 1945, 316-322. "The intention and result of a scientific inquiry is to obtain an understanding and a control over part of the universe. This statement implies a dualistic attitude on the part of scientists. Indeed, science does and should proceed from this dualistic basis."

N. Wiener, "Some Maxims for Biologists and Psychologists," *Dialectica 4*, 1950, 186-191. "No self-respecting scientist has any right to attempt to give the impression of a mathematical analysis of difficult situations, unless he is using language which he can understand and which he can apply concretely. Short of this, a purely descriptive account of the gross appearance of a phenomenon is both more honest and more scientific... let me lay the ghost of another pseudo-scientific bogy: the bogy of "wholism." If a phenomenon can only be grasped as a whole and is completely unresponsive to analysis, there is no suitable material for any scientific description of it; for the whole is never at our disposal... Mathematics does not consist in a specious accuracy irrelevant to our observations, but in the meticulous treatment and observation of the uniformities which lie within the range of our system of experiment. If this cannot be done, let us avoid the language of mathematics. Let us have done with this sorry profanation."

A. Rosenblueth, N. Wiener, and J.G. Ramos, "Muscular Clonus: Cybernetics and Physiology," presented in preliminary form in 1946, but published for the first time in *Norbert Wiener: Collected Works with Commentaries, Volume IV,* 1985, 466-510.

N. Wiener, "Dynamical Systems in Physics and Biology," *The New Scientist 21,* 1964, 211-212. "1 am looking forward to the growth of studies of dynamical systems, not merely for the sake of fundamental physiology, ... but also for techniques of healing or ameliorating human deficiencies... 'artificial homeostasis' represents an extension of the ideas used in the artificial pacemaker for the heart. I am looking forward to such developments not merely as a direct technique for the treatment of people under a physiological disability, but as a powerful experimental tool in the development of what I expect to be a new medicine."

N. Wiener, "The Future of Automatic Machinery," *Mechanical Engineering* 75, 1953, 130-132.

N. Wiener, "The Electronic Brain and the Next Industrial Revolution," *Cleveland Athletic Club Journal,* January 1953.

N. Wiener, "The Machine as Threat and Promise," *St. Louis Post Dispatch,* December 13, 1953. "Automatization represents a step, and a very important step, in our increased ability to control the world about us."

N. Wiener, "Limitations of Science," *Technology Review 37,* 1935, 255-256, 268, 270, 272. "... scholars should interest themselves in useful matters. Nevertheless, I have no hope that the problems of sociology will be solved by a mass attack of men trained to the natural sciences..."

N. Wiener, "A Scientist Rebels," *Atlantic Monthly 179,* 1946, 31. 'I do not expect to publish any future work of mine which may do damage in the hands of irresponsible militarists."

N. Wiener, "A Rebellious Scientist after Two Years," *Bulletin of the Atomic Scientists 4,* 1948, 338-339. "... it is clear that the degradation of the position of the scientist as an independent worker and thinker to that of a morally irresponsible stooge in a science-factory has proceeded even more rapidly and devastatingly than I expected. This subordination of those who ought to think to those who have administrative power is ruinous for the morale of the scientist, and quite to the same extent it is ruinous to the quality of the objective scientific output of the country... a man who is not willing to take moral responsibility for his acts as a scientist is scarcely the best man to take scientific responsibility. The enormous scale of modern science offers a splendid opportunity for the old army game of passing on responsibility both for the truth of one's own constructions and for the consequences of one's own policy. This trend must be halted... I still see no reason to turn over to any person, whether he be an army officer or the kept scientist of a great corporation, any results which I obtain if I think they are not going to be used for the best interests of science and humanity."

N. Wiener, "Science and Society," *Technology Review* 63, 1961, 49-52. "... science must learn much more than it knows how to use, and must resist the temptation to use any information it has received merely because there is a way to use it... I do not subscribe to the view that the man of science should live in an ivory tower, leading a life of the intellect alone, and completely indifferent to the use which may be made of his ideas. On the other hand, he must be able to work with the immediacy of the pressure for results taken off his back and he must not let himself become, merely, a vehicle to feed ideas to others who will not see the possibilities he sees, and are merely interested in immediate results according to a code of their own in which the scientist plays no responsible part... Certainly scientific work should be answerable for its value to the community—but at arm's length."

The Utility of Cybernetics

By Stafford Beer (The Stafford Beer Foundation, 34 Palmerston Square, Toronto, Ontario, CANADA M6G 2S7). Copyright 1988 by Stafford Beer.

No one to my knowledge has ever challenged the priority of Norbert Wiener to define the science of cybernetics. He called it: "The science of control and communication in the animal and machine." It has always seemed to me that he was making two very strong points within this definition which have been lost to sight in the years since 1948 when *Cybernetics* was first published.

First: regulation is dependent upon the flow of information, and also (as Conant and Ashby later showed rigorously) on the adequacy of the model the regulator incorporates of the process to be regulated. Second: there are invariances that govern such regulation within any complex system, whether in the world, the flesh, or the metal. It distresses me that the second point is so underrated by contemporary cybernetics. This is surely thanks to the prevailing method of reduction in modern science. We have almost lost sight of the early discoveries of cybernetic science—for instance that error controlled negative feedback is a fundamental mechanism in systemic regulation, and that information is the negative entropy that defines and sustains the system itself.

These discoveries concern the way that nature works. Whether they are mere curiosities or have some use depends not on the science but on the scientist and the paymasters of science. Consider how long it took to use the discovery that the movements of heavenly bodies are conic sections—in the design of space flights.

As to the use of the word "control," the forty years since Wiener's book appeared have failed to understand the subtlety of those original investigations into its use. Control was not to be equated with the pulling of levers, or the fiat of guns. There was nothing necessarily deterministic about the notion of control at all.

When I came on the cybernetics scene, working in industry, I found it very difficult to talk to practical men about all this. Managers treated their appointments as being like military commands, and put emphasis on such words as "obedience" and "loyalty." Quantification was undertaken by accountants using mechanistic models (and still is). "Communication" meant giving pep talks to the work-force. As to "information," negentropy notwithstanding, that was a matter for public relations consultants! As far as industrial scientists were concerned, the dichotomy between what is organic and what is inorganic, which can be traced back to Aristotle, blinded them to the notion of regulatory invariance across all complex systems.

Thus it was, and precisely for utilitarian reasons in that I was putting all these insights to work, that I proposed a new definition of cybernetics as "the science of effective organization." I did my intellectual duty: I took this definition, and my reasoning, to Norbert Wiener. He had encountered the same problems himself, and gave me his blessing.

What is a science? The Latin root is clear enough: a science is a knowing. I like the definition: ordered knowledge. It has to do with understanding, with insight. A science, as such, has no utility—except to the enlightenment of the scientist—s/he who has the knowledge. S/he may do this for whatever reason, fair or foul; but the utilitarian purpose can be ascribed only to the knower of the science, and not to the science itself which has no such teleology.

During the 1950s, and from these theoretical bases, I began to say—even to preach—precisely this: "Management is the profession of regulation of which cybernetics is the science." In this, I contend to this day, a science discovers a utility. The

science is quite independent of that utility. There may be other utilities, moreover—for instance in prostheses or economics. But that there *is* a utility (in this case managerial) of the cybernetic science seems to me in both principle and fact undeniable. This was exactly the message of my first book, *Cybernetics and Management,* which was published thirty years ago this year. That was the first of ten books which have recounted my experiences in what might be called both pure and applied cybernetics.

Of course, it is open to people to ignore a scientific discovery on the grounds of triviality, let's say. An outstanding example is the managerial disregard for Ashby's Law of Requisite Variety. The overly modest Ashby was the first to remark that it looked obvious and truistic. In that case, however, why did managers demand "simple and cheap" control systems for complex and expensive plants? Why did ministers expect to regulate an entire economy by manipulating interest rates? Is it not the case that we maintain models of family and friends that do not exhibit requisite variety, and then say "she is not herself today" and "that's not *him* at all"?

Once the force of Ashby's Law comes home, it acquires immense utility for the designer of regulatory systems in real life.

I met with Ross Ashby frequently for about twenty years, shared hundreds of examples of this utility with him, and sat up late with him trying to redesign society in cybernetic terms. So when another close friend would argue with me over the same period that Ashby's Law was "nothing but" a tautology,

I used to reply: "Yes, and the whole of mathematics is either tautologous or wrong." It does however come in handy.

My career has hinged on the utility of cybernetics. Even so, I have to admit that I am enamored of pure knowledge. I enjoy doing cybernetics for its own sake. Allow me then, in conclusion, to escape from proud utilitarian boasts. I found this discovery in a medieval Latin manuscript: *Summa scientia nihil scire* (the height of wisdom is to know nothing). This is second-or even third-order cybernetics; but even this has its utility, I find.

Cybernetics and Utility

By Ranulph Glanville (Programma OOC, University of Amsterdam, Grote Bickersstraat 72, 1013 KS Amsterdam, THE NETHERLANDS). Copyright 1988 by Ranulph Glanville.

I find I cannot think of cybernetics in quite the same way as I think of the DA's on my Macintosh. DA's are utilities, of a sort, and they are really nice. But cybernetics is not quite such a simply entertaining device. That's how it seems to me.

Nonetheless, I have no objection to things being useful. So I am delighted to find that, for some people, cybernetics is useful (a utility). I suppose that, even for me, it could be described as useful: it keeps me occupied when I might, otherwise, be out on the street doing something stupid and anti-social, like mugging someone, and it gets me invited to all sorts of exciting places. If that's useful, then cybernetics is useful to and for me.

And yet I am uneasy about this notion, and I am sure that this is not the notion that we are invited to begin conversing about.

In fact, I am more than simply uneasy, I am profoundly uneasy—to the extent that I really doubt that the notion of utility (except in a fairly trite sense) is appropriate to cybernetics. In spite of what I wrote above.

Why?

I think the difficulty lies in the concept of purpose. As I said, I am happy for cybernetics to be found useful. But I am distinctly uneasy when usefulness becomes treated as its purpose, its *raison d'être.*

The purpose of cybernetics, it seems to me, is cybernetics. I would have thought that, by now, with second-order cybernetics being a well established and no longer spotty teenager, there could be little continuing doubt about this. What cybernetics studies is cybernetics, and it studies it cybernetically. That is what cybernetics is best equipped to do, and it is also true that cybernetics is equipped with the best approach through which to carry out these studies.

Sometimes, as a result of these studies, we get a spin-off: something that is useful within another area, which can thus benefit from cybernetics. This is purely fortuitous—serendipitous, to use an old, cybernetically associated word—and it happens because of a co-incidence (1). This co-incidence can only happen when there are (at least) two areas that can coincide, one of which is, by definition (in terms of this discussion), cybernetics.

And here we have, I think, the crunch. Unless there is a healthy field of cybernetics, this co-incidence can hardly occur, for there is no cybernetics to participate.

If the purpose of cybernetics is not cybernetics, but is usefulness/utility, we have a different field than we thought we had. And, in my opinion, we have one which is in danger of losing its integrity, its identity, and its individuality of approach and character, which is what I value most about cybernetics. It is in danger of becoming a repository of tools, to be borrowed and (ab-)used by anyone, without respect or love, in the way that someone who is ignorant might use a chisel, for instance, to open cans. It risks, as does any subject that sells out to the overriding and insidious criterion of usefulness, becoming incoherent. It might even become an area so devoid of a self, so lacking a morality, so prepared to whore itself for any short-term gain, that it would make Mrs. Thatcher appear an ethical giant instead of a paltry, greedy shopkeeper (2).

There is, as I have written, nothing wrong with being useful. But there is everything wrong with demanding usefulness, assessing according to the criterion of usefulness, and disregarding the right of a subject to be itself in its own way. Any field that demands to be above other fields, any means of assessment that insists on its own right and priority in other areas is a very dangerous thing, intellectually. And anyone who presumes to think that they can (or should even try to) accurately predict what will be useful in five years' time is a fool.

What cybernetics needs is to treasure its own sanity and integrity by daring to be, and to study being itself, not trying, or being forced to be a universal, panaceaic, janitor's general all-purpose tool kit.

Notes

1. I should like the pronunciation of co-incidence, in this instance, to be in two equally emphasized parts—*co* and *incidence* (accent on the *ci*)—to indicate that I do not mean only that sense of the word associated with chance, but also the coming together of more than one "thing."

2. Another way of referring to this is as the "problem" of quantification. It is, we all know, easy to handle the quantifiable: we have spent a whole civilization developing our expertise in this area, and that's fine. Except when, as so often and so easily happens, we discard that which cannot be quantified as being unworthy or insignificant. Then we end up with the same thing: the useful—the quantifiable—the usable becomes everything, and quality is dismissed.

A Letter

Dear Greg,

"Is cybernetics useful?" you ask, and I recall that Herbert Bran once suggested to Heinz von Foerster that it would be "fascinating to contemplate an educational system that would ask of its students" answers to "legitimate questions," "questions to which the answers are unknown." In his paper "Perception of the Future and the Future of Perception," Heinz uses Herbert's marvelous distinction between legitimate and illegitimate questions to establish the ground from which he can assert that in a society where the "members perceive one another as autonomous non-trivial beings" it will be discovered that "Education is learning to ask legitimate questions."

This definition of a legitimate question and its accompanying assertion has been found by me to be fertile ground. I have several candidates to suggest as educational systems for contemplating. One amongst them dealing directly with the issue of questions is Warren McCulloch's "What is a number that a man may know it; and a man that he may know a number?"

That question appears to me to be cybernetically phrased, educational, and useful. Certainly, Rufus Jones, the Quaker philosopher, predicted correctly when, as McCulloch tells us, his response on first hearing that question was, "Friend, thee will be busy as long as thee lives."

McCulloch comments, "He was right. Though I did not know it then, I had become a cyberneticist." For me, from the first moment of encounter, before I had heard either of the conversations/stories reported above, it was seen as a *whole,* i.e., a peculiarly, particularly *cybernetic* question.

After contemplating this question as system for some time, I saw that it could be reduced to "_____;_____?" That, I decided, would be the form I would use for casting and re-casting questions. It became for me a useful tool.

Let me show you what I'm getting at with a question of my own. Its original phrasing was inept, blame-laying, simple-single-cause-seeking. Rephrased, it became "How many people misunderstand one another; how may I misunderstand other people?" Paul Pangaro gave a nice demonstration of an answer to my question at the tutorial before the Urbana ASC meeting, remember?

Since I want to reformulate "Is cybernetics useful?" into what I'll call the McCulloch format, "_____;_____?", I'll use his language as well as his form, in so far as that can be done without distortion: "What is cybernetics that a person may know it; what is a person that one may know cybernetics?" A possible answer is "Cybernetics is a scientific discipline that may be used to explore and investigate the asking and answering of questions."

Gordon Pask is a person for whom the theme of cybernetics is "... how systems regulate themselves, reproduce themselves, evolve and learn. Its high spot is the question of how they organize themselves." He applies his knowledge of cybernetics to the behavioral sciences in order to examine human learning and performance, conversations, cognition, and person/machine interactions.

Clearly, cybernetics has been made use of by him. When we use the machines (books, papers, lectures, machines, works of art, conversations, etc.) that are provided by what Paul Pangaro so correctly calls "the many Gordons" in order to sift our understandings from our misunderstandings of ourselves, then we may make cybernetics useful. When we undertake to explore what Heinz so poetically calls "zee Paskian Uneeverse," then we may make cybernetics useful. What may be known may be used.

What science, poetry, and number have in common is that each may be known and used as a constructive device that has its own unique history even as you and I. Each may be known and used as made up of analogues and replicable indications. Often I have been asked "What use is poetry?" It never dawned on me that cybernetics would be cast in the same pile, so my eyes opened wide at the sight of your question.

Poets address their readers as "autonomous non-trivial beings." If they did not, they could not act as if marks on the page would have the power of communication and control that they know poetry has. The same may be said for creators in the sciences and mathematics, for they, too, address their readers as autonomous non-trivial beings. Just think of the times that you and I heard or spoke with Francisco Varela and Louis Kauffman. (I select their names as I consider representatives of each field with whom you and I have had personal contact. Also I am wanting to enlarge the field, rather than repeat myself.)

When Ernst von Glasersfeld speaks of cybernetics as "meta-disciplinary," I understand him to be referring to its capacity for allowing us to embrace science, poetry, mathematics, music, ..., all the great disciplines that any of us may choose to know and use. There is a great freedom to be found in that embrace. I think it is the kind of freedom referred to in this piece by Emily Dickinson:

Precious Words

He ate and drank the precious words.	He danced along the dingy days,
His spirit grew robust;	And this bequest of wings
He knew no more that he was poor,	Was but a book. What liberty
Nor that his life was dust.	A loosened spirit brings!

(From *The Complete Poems of Emily Dickinson,* T.H. Johnson, editor, Little Brown and Co., Boston, Toronto, 1960.)

My inclination is to nominate her as a practicing cybernetician.

Yours as always,

K

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P.S.

As I was assembling my references I chanced to encounter again the piece of Ross Ashby's which follows Gordon's in *Cybernetics of Cybernetics* that I cited above. It was my own underlining that caught my eye. On page 24, section 1/6, under the heading "The uses of cybernetics," I found this:

> There are, however, two peculiar scientific virtues of cybernetics that are worth explicit mention.
> One is that it offers *a single vocabulary* and a *single set of concepts suitable for representing the most diverse types of system...*
> The second peculiar virtue of cybernetics is that it *offers a method* for the scientific treatment of the system in which complexity is outstanding and too important to be ignored...
> Cybernetics offers the hope of providing effective methods for the study, and control, of systems that are intrinsically extremely complex. It will do this by first *marking out what is achievable* (for probably many of the investigations of the past attempted the impossible), and *then providing generalised strategies, of demonstrable value, that can be used uniformly in* a *variety of special cases.* In this way it *offers* the *hope* of providing the essential methods by which to attack the ills—psychological, social, economic—which at present are defeating us by their intrinsic complexity. (Italics mine.)

<div align="center">K</div>

Should Cybernetics Be Useful?

By Ernst von Glasersfeld (37 Long Plain Rd., RFD 3, Amherst, MA 01002). Copyright 1988 by Ernst von Glasersfeld.

Some years ago, when I was asked to compile a statement about cybernetics for the American Society for Cybernetics, I wrote, among other things, that cybernetics is a new way of thinking, not a collection of facts. I also mentioned that each cybernetician has his or her own way of defining the field, but that, nevertheless, there is a certain amount of consensus about a number of topics that are considered to be part of it. Self-organization is one of these topics—but how one elaborates on that topic and where one chooses to see manifestations of it is very much an individual affair.

For me, the notion of self-organization is crucial in the attempt to answer the question about the utility of cybernetics. However, if I try to explain this, I hope it will be understood that it cannot be anything but *one* individual's answer, and that this individual will not be surprised if readers should consider it so idiosyncratic as to be irrelevant.

One of the great revelations of the cybernetic way of thinking was and is for me the idea that living systems can be considered informationally closed. That means that the notion of self-organization must apply also to what we want to call "knowledge" or, in the simplest terms, that knowledge must be built up *within* the system from material that is available *within* the system. If this is taken as a working hypothesis, the role of knowledge changes. It can no longer be assumed that knowledge could be, let alone ought to be, a representation of an independent world

that "exists" as such outside the cognizing system. The moment one says this, someone objects that one is talking solipsism. But that is just another manifestation of the either/or mentality we are trying to get rid of. If the cognitive organism cannot depict an ontological reality within itself, the results of its cognitive activity are not necessarily pure, unadulterated phantasy. Knowledge may still be seen as the accumulation of ways and means the organism finds to attain its material goal of staying alive, as well as its intellectual goal of integrating these ways and means into a relatively consistent and non-contradictory conceptual network; and these two goals can be subsumed under the term "equilibrium." In other words, knowledge may have, as Piaget has long maintained, an *adaptive* function.

To adopt this way of thinking is, I would suggest, extraordinarily *useful—especially* in the kind of experiential world in which we are struggling today. Above all, it leads to the conviction that although we may be unable to organize and control others, we should always be able to organize and control ourselves. This conviction has momentous consequences in our interactions with others, interactions under the banner of love as well as under the banner of enmity. As a corollary, which Maturana has so beautifully formulated, *power can never be imposed, but only conceded.* This idea, of course, is enormously difficult to live up to in practice. We have all been educated and trained to believe that it is often necessary and moral to concede power, against our own judgement. Hence, we have developed the habit of conceding power to others and then complaining that we are compelled to do so. However, if we try to adopt the cybernetic principle of self-organization, and to realize the entailed autonomy, we may begin to construct a new ethic—founded not on the concept of competition, but on the concept of collaboration.

My answer to the question, then, even without taking into account whatever practical uses cybernetics may have, is an unconditional yes. The idea of cognitive self-organization makes for a richer and less cantankerous life than the linear idea of external causes and internal effects—simply because there is always more than one way to maintain an equilibrium.

Psychology and Ecology: On the Unavoidability of Ethics

By Jürgen Hargens (Norderweg 14, D-2391 Meyn, GERMAN FEDERAL REPUBLIC). Copyright 1988 by Jürgen Hargens.

Whenever a psychologist is writing about an issue such as ecology, one can always ask what will be the core and central theme of his elaboration—because, apparently, psychology has more to do with the inner life of people than with dealing with nature. And already here might be the very first misunderstanding: People are nature, or at least part of nature. A person is a living being who is involved in the circuit of nature—an understanding of which most "primitive" people are aware, but which has been lost by "civilized" people. Maybe here we will find one of the reasons why so-called "modern" or "leading" (industrial) nations try to impose their way of living on so-called "developing countries."

As I see it, ecology is not a mere specialty, but a certain way of looking at the world (and constructing it). In this respect, ecology is not a new discipline, not a new special science which will produce new specialists, and in doing so will reproduce the existing structures of up and down, of knowing and not-knowing people ("laypersons" or "greenhorns").

We are approaching the core: it is a matter of epistemology—it has to do with the way we construct our view of the world in which we are living, and it has to do with the responsibility and accountability which is laid upon us by the image/picture of the world (which we have constructed). And it is just here where psychology and ecology meet.

In recent times in the field of psychology, there has been more and more attention given to approaches which are named variously (holistic, systemic, cybernetic, ecosystemic). Common to all of them is a particular understanding of the world which I will comment on below.

The "hard" sciences especially have sharpened our awareness that we are not able to see the world "out there" the way it "is." There is no "objective" description of reality. The conditions of our experiments determine which results we will get; our perception is only in a small way a representation of the outer world inside of us—cognition is a process through which we are constructing our world ourselves, and consequently we are responsible for the construction of that world. I just want to point to the "new physics": to themes such as quantum mechanics, the Heisenberg uncertainty principle, relations between "wave" and "particle," etc. (Zukav, 1979) And I want to point to experimental foundations of a biological theory of autopoiesis which is connected with the name of Humberto Maturana. Here I can only touch on some aspects of Maturana's theory without giving detailed information. But it is necessary to mention this theory, because parts of the following refer to it. Maturana sees the nervous system as an operationally closed system. Its reactions are determined by its structure, not by influences from outside. The nervous system does not "represent" an outer reality inside. Its reactions are structure-determined.

These insights overrule much of what has been held in the past to be true and incontestable. The nervous system is interacting with its own states—so there are no possibilities to perceive and to determine the world "out there" objectively. On the contrary—the nervous system in-forms its own "information" in its own specific ways. A distinction between "subjective" and "objective" doesn't make any sense. To in-form among ourselves is possible because we are constructing a domain in which we are coming to agreement(s)—agreement(s) between scientists. In this way, the scientist (the observer) becomes the central issue. We don't come to theories about that which is, but about that which scientists have agreed upon.

If we put objectivity in parentheses, distinctions such as "right / wrong," "objective / subjective," "victory/ defeat," healthy/ sick," etc., lose their absolute sense, but not their consensual, pragmatic, and thus action-guiding sense. Controversies lose their missionary character (note that missionaries may have a high probability of being eaten by cannibals). Sociality doesn't break down into chaos and anarchy, into arbitrariness and power struggles—on the contrary. If I construct my picture of the world by myself (or if I am at least participating in its construction), then I am also responsible for these (my) constructions. And my constructions react upon me, because I am part of just these constructions (recursively; circularly).

Such a view has some basic effects on an understanding of "pathology"; to use Keeney's words (1983, 126): "... health in human ecosystems refers to a 'vital balance' of diverse forms of experience and behavior. To engage in an effort of maximization or minimization... leads to the escalating sameness we have defined as pathology."

Another important aspect of this view concerns cybernetics. Cybernetics is often defined in a simplistic way as some kind of "science of regulation" or of "steering"—nowadays cybernetics is also concerned with the regulation of regulation, what is called "cybernetics of cybernetics."

Let us assume that we are looking at some system, i.e., some composed unity. Just here I have drawn a first, crucial distinction—I have defined a system which I have differentiated from something else (e.g., its surroundings, including the observer).

The definition of a system is always an act of distinction (cf. Spencer Brown); there is no such thing as a system by itself!

Now we observe some operations of/within this system, trying to describe them in order to find out the way this system works/functions. Just here I have drawn a second distinction (or belief, or premise): a system has a function. "Function" is a characteristic which is ascribed to a system by an observer—it is not a characteristic of the system. Going back to Maturana, it follows from the closure of living (autopoietic) systems that an observer is able to describe a different system only from his own perspective, but in no case from the point of view of that system itself. And such a description is only possible within a domain in which the observer and the system are coupled and interacting. The description of an observed system is always done from "outside," from an observer, and only with respect to a domain which has been—more or less explicitly and discernably—defined and determined. Here we see again that it is impossible for us to describe "objectively" and "truly," and that we can only come to agreements about our descriptions. And in doing so, we should not forget that a system has its own organization—independent from our descriptions—and as an autopoietic (living) system, it produces all those components which contribute to its maintenance.

We have come to another central issue: living systems are autonomous entities which behave/react autonomously. Interventions into such systems can be seen as perturbations for which the systems try to compensate structurally. There are just two alternatives: either the perturbations are compensated for, or the perturbations result in the end of a system's organization—in its death.

And just here we find an approach to a "systemic ethics": interventions, perturbations cannot be defined from outside, i.e., by those who intervene or perturb, but solely by the structure of a system. The system itself, its structure, determines whether it even "perceives" an intervention/perturbation, and which reaction (structural change(s)) it will pass through.

Put differently, one who believes in being able to influence a system purposefully makes an error. If (at all, and, if so, which) influence is exerted can only be determined by the structure of the system. This opposes the ideas of power, of domination, of arrogance, and of *hubris* which are very often found in the minds of people, and which lead to the belief that humans are able to gain "control over nature." And with this, we are coming back to one of the protagonists of these ideas, Gregory Bateson (1979, 223): "It is not so much 'power' that corrupts as the *myth* of 'power'." It is not the contentless power which is misleading, but the belief that you can get power and exert it.

By this, we have come back to our beginning—to the issue of epistemology. And this is not just a mere theoretical or philosophical question, but a very pragmatic one, essential for life. We are acting in accordance with our epistemology. It determines how we see and understand nature and life, and how we handle them—as intervenors, technologists, etc., or as respecters of the autonomy of living (and ecological) systems, willing to accept and protect their diversity and differences. And in doing so, we should not forget: we ourselves are autonomous living beings who must be concerned about whether our surroundings are respected and protected by other persons.

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The Notions of Cybernetics

By Humberto Maturana (Departamento de Biologia, Facultad Ciencias, Universidad de Chile, Casilla 653, Santiago, CHILE). Copyright 1988 by Humberto Maturana.

The notion of control entails the implicit supposition that the observer either can specify what happens in a system, or can make a complete model of it, so that his or her actions determine what happens in it. Neither of these phenomena happen. Structural determinism precludes both, the first because there are no instructive interactions between structure-determined systems, and the second because cognition does not operate with representations of an independent world. The notion of understanding is different; it refers only to the reflections of an observer with respect to the flow of his or her interactions in a medium as he or she operates in a discourse that reflects the operational coherences of his or her coordination of actions in language.

Thus, in the case of the steering of a ship, the skipper can only trigger structural changes in the ship through his or her interactions with a wheel that moves the rudder without specifying the course that this will follow. The course of the ship arises as a result of its recurrent encounter with the waves and the wind, in a process known as drift. As the shape of the ship changes through its interactions with the skipper at the wheel, the course of its drift will change because its manner of encounter with the waves and the wind will change. As the skipper acts from his or her metadomain of discourse as an observer, in what we may call his or her understanding of the situation, the shape of the ship (the position of the rudder) will change through the interactions of the skipper with the wheel in a manner contingent to his or her understanding. In our daily discourse, we say that the skipper controls the course of the ship through his or her manipulation of the position of the rudder as if he or she were determining the course of the ship, but the phenomenon that takes place is not that. What the skipper does is to make his or her understanding part of the domain of interactions of the ship, thus making the drift of the ship contingent to it.

The phenomenon of control exists only in the discourse of the observer as a metaphor of what the skipper does, not as a feature of how the course of the ship is constituted as the ship moves under the skipper.

Due to this then, the task of the skipper in a ship is one of understanding. Indeed, the whole training and preparation of a person who will become skipper is oriented towards expansion of his or her domain of experiences in a manner that makes such understanding possible in him or her when in the ship. Accordingly, I propose to change the meaning of the word *cybernetics*. I want it to mean "the science and art of understanding." If we were to do this, our Society of Cybernetics would necessarily embrace all the avenues of concern and reflections that have to do with the understanding of systems. That such expansion is taking place is apparent in the coming into our Society of people concerned with family therapy, sociology, psychology, etc.

(What are the implications of Professor Maturana's position above for the designing of boats (or societies)? I would like to invite responses for the next issue of this newsletter. Larry Richards)

On Cybernetics as Reflexive Understanding

By Frederick Steier (Department of Engineering Management, Old Dominion University, Norfolk, VA 23508). Copyright 1988 by Frederick Steier.

In early November 1984, I was asked, near the conclusion of the American Society for Cybernetics annual meeting in Philadelphia, if I would write an essay for a family therapy journal, addressing the question: "What kinds of things can family therapists get out of cybernetics, anyway?" The request came from a representative of the journal who was attending the meeting as an "observer," and it should be fair to point out that he was not the only person asking this question in this way. I suppose that my assignment was one of trying to convince the family of family therapists/researchers, and others, that there truly is something "in cybernetics." In the end, I wound up writing an essay trying to explain that a cybernetic way of seeing would allow one to understand that the above was a "blinding" question, and *not* really a good question to ask. A "container" metaphor of cybernetic knowing, from which one could then remove "things" was not, it seemed to me, a cybernetic approach. The essay was, not surprisingly, not accepted for publication in that journal.

In the essay, I argued that the concerns that might have motivated the above question might best be addressed if one realized that cybernetics might best be thought of, not as a discipline, but as a *way of seeing.* I chose "way of seeing" rather than, for example, "point of view" (its counterpart among knowledge as "vision" metaphors) because (1) I felt that it more strongly implied the inclusion of the observer in the loop that we call a cybernetic system (as a point of view is generally "of" something else that might be there apart from an observer), and (2) it allowed for a focus of a cybernetics of processes and patterns, rather than that of things. The latter process issue I felt to be especially important as cybernetics itself can be seen as being "in process," in the sense that Wiener's original definition, of the study of control and communication in the animal and the machine, did not (and does not) seem to fit any more. At that time, a group of us who met regularly in Philadelphia felt that a definition that might fit better might allow us to recognize that cyberneticians were concerned with processes of organization (including the observer's), and their inherent circularities.

As I recall this recent past, I realize that my concern for an evolving definition has been due to several factors. One of these has been an attempt to understand what cyberneticians (myself included) do, and how we see, an attempt made more serious by the recognition that cybernetics (particularly since the articulation of a second-order cybernetics) has allowed us to become our own anthropologists, by always turning our ideas back onto ourselves through core relationships of circularity and reflexivity.

When cyberneticians are asked to introduce themselves (by locating themselves in a "discipline"), what stands out most clearly is that most are also outsiders in their own and other disciplines—"professional outsiders," as it were. And yet it is by working with people who are outside our "domain," who profess to be interested in understanding cybernetics and working cybernetically, that we come to see precisely how cybernetics can inform other areas, as well as how these other areas, in trying to experience cybernetics in their own domains, can inform cybernetics. This mutuality is key.

There is another outstanding factor related to the formulation of an adequate definition, that has stimulated tremendous epistemological excitement in all whom cybernetics has recently touched—namely, those ideas of second-order cybernetics,

and what can be referred to as "second-order constructivist" approaches to knowledge. And yet, a danger we must be wary of is the labeling of thinking as first order vs. second order, for it seems to me that if we truly understand the cybernetics of cybernetics as being "cybernetic," it had to be (and was) implicit in Wiener's original formulation to allow us to apply "it" to "itself" in the manner that we do. At the same time, we must also be wary of understanding second-order ideas in a first-order frame—such as trying to objectively study "other observing systems" somehow apart from *our* own tools (and thus, my referring to a "second-order constructivism"). It is too easy to fall into the functionalist trap of taking all attempts at knowing and translating them into "how to" questions.

The functionalist trap is no small issue here, as cybernetics has traditionally been categorized, in "methods of knowing" classification schema, as being functionalist/mechanistic (opposed to, for example, an interpretive position), as, for example, Morgan and others do. The difficulty is that strictly functionalist perspectives invite questions of the type with which this note began, and others of the "strictly how to" variety, without allowing for any of the reflexiveness so necessary to modern cybernetic thought.

And so, what I would like to argue for is an understanding of a definition of cybernetics that allows for both first and second-order concerns, without inviting the "how to" syndrome. Here I believe that recent work of Maturana, where he argues for cybernetics to mean "the science and art of understanding" (see his article in this *CC)* is on the right track, but with some modifications, as I shall explain below. What does seem clear is that, while control and communication are important cybernetic issues, these need to be rethought in view of how such ideas have been heard and used in communities of observers who claim to be faithful to their reading of cybernetics. For example, I have always found that most people have never fully understood control as being a property of a system, and have rather always looked for "the controlling" and "the controlled" parts of systems. Most of the remaining people who have been able to understand control as being a property of a system still leave out the observer; or, in the case of readers of the journal alluded to at the beginning of this paper, the helper/intervener/researcher. Thus, to them, although a system may be "self-controlling" or self-regulating, one can still "get it to do what you want it to" by putting it into the proper environment in which such self-controlling behavior tends to exhibit itself. I think it is no coincidence that cybernetic views of control have been "misheard," given the tendency of the communities we are embedded in to hear the term "control" in a particular way. Cybernetically seeing, then, in the general situated use of the term, no thing gets "controlled." The term "understanding" is a more modest and apt descriptor of what cyberneticians are engaged in, and has no such difficulties. It would also appear to bring us closer to other more process-oriented thought

But again we must be careful. Understanding, like interpretation, can often be thought of as needing to be "of something." This is precisely the difficulty that hermeneutics has found itself in—namely two versions of understanding. On the one hand, we have hermeneutics as the "objective" interpretation of texts, while on the other—much closer to modern cybernetics—we have the hermeneutic "merging of horizons" of a text (and its producer) and an active interpreter. So we must not feel that understanding must be of something that exists apart from the very process of understanding. More importantly, we must understand understanding as being linked to action—the active understander, who becomes an understander by participating in a network of understanding in a situation.

I propose then to mean when I say cybernetics, the art and science of *reflexive* understanding, for this makes clear the circularity that has been the hallmark of cybernetics by speci-

fying what cyberneticians most generally do. Please note that reflexive is generally understood in two ways, both involving a turning back into a self. The distinction hinges on the circuit through which this turning back takes place. Reflex actions (such as the knee-jerk), as we usually think of them, involve being in a situation without reflecting. We are certainly interested in this kind of understanding, the kind that emerges from immersing yourself in a situation and knowing how to behave. Such a circuit might be thought of as a small-circuit reflexivity. On the other hand, second-order cybernetics has certainly allowed a long-circuit reflexivity, including a reflective knower in the act of understanding in a situation, for it is this reflexivity that has allowed cybernetics to indeed be applied to itself. In fact, it is precisely through a long-circuit reflexivity that assumptions embedded in a small circuit can be questioned—perhaps allowing the small-circuit reflexivity to become "short-circuited" and exploding our assumed and tacit world.

Interestingly, I think that we do not have to lose the power of control theory ideas here, but they can now be expanded to include the "subject's" and the "researcher's" understanding of the research context, including the requests of the researcher in a situation, rather than a "controlling a joystick" experiment. Further, I should also point out that cybernetics can thus address practical questions, but these practical questions must be understood in a new reflexive and reflective light.

Not Without Us

By Joseph Weizenbaum (Laboratory for Computer Science, Massachusetts Institute of Technology, 545 Technology Square, Cambridge, MA 02139). This is a translation of a talk given in German to the Association of Computer Professionals in West Germany in July 1986. You are welcome to reproduce and distribute it.

Whenever I come to Europe, especially to West Germany, I am amazed by the normality of everyday life: superhighways, "music" that assaults one in restaurants, the many parks, the forests of television antennas on the roofs of houses, and so on. I am amazed because of Europe's geographic position and all that follows from it. In West Germany, for example, there is the border with the other Germany, dense with military installations of all sorts. There are holes in the streets that are intended to be filled with nuclear land mines if Russian tanks should come. These are signs of Europe's physical and psychological proximity to the final catastrophe.

We in America are, in a certain sense, no more distant from the catastrophe than the Europeans are. Not only Chernobyl, but also the threat of war is everywhere. And war is everyone's enemy. In case of war, regardless of whether unintentionally initiated by technology allegedly designed to avert war, or by so-called statesmen or -women who thought it their duty to push the button, you may die ten minutes earlier than we in fortress America, but we shall all die.

But we have no holes in our streets for atomic land mines that are intended to delay Soviet tank regiments. We see our missile silos only now and then—that is, only whenever it pleases someone to show them to us on television. No matter how passionately our government tries to convince us that the nasty Soviets are effectively as near to us as to Europeans, that they threaten us from Cuba and Nicaragua, Americans are, on the whole, quite unconvinced and untroubled by such efforts. The American experience of war has allowed us to develop an "it can't happen here" attitude, rather than a concrete fear of what appears to be far removed from the immediate concerns of daily life.

We know that it is emotionally impossible for anyone to live for very long in the face of immediate threats to existence without bringing to bear psychological mechanisms that will exclude these dangers from consciousness, permitting them to surface only rarely. But when repression necessitates systematically misdirected efforts, or excludes potentially life-saving behavior, then it is time to replace it with a conscious effort to find the prod to correct action.

That time has come for computer professionals. We now have the power radically to turn the state of the world in directions conducive to life.

In order to gain the necessary courage—not all of us are saints or heroes—we have to understand that for us as individuals, as well as for those we love, our present behavior is far more dangerous, even life threatening, than what healthy common sense now demands of us. None of the weapons that today threaten every human being with murder, and whose design, manufacture, and sale condemn countless people to starvation, could be developed without the earnest cooperation of computer professionals. Without us, the arms race, especially the qualitative arms race, cannot march another step.

What does this say to us?

First, that we computer experts—as well as specialists in many other technical domains—share in the guilt of having brought about the present dangerous state of the world. Those among us who, perhaps without being aware of it, devote our talents and strengths to death rather than to life have little right to curse politicians, statesmen and -women for not bringing us peace. It isn't enough to make pretty posters that can be carried in demonstrations. Those who carry them must care whether their daily work helps to make possible the very devices the use of which they are protesting.

At this point, the domain called artificial intelligence (AD comes especially to mind. Many of the technical tasks and problems in this subdiscipline of computer science stimulate the imagination and creativity of technically oriented workers particularly strongly. Goals like making a thinking being out of the computer, giving the computer the ability to understand spoken language, making it possible for the computer to see, offer nearly irresistable temptations to those among us who have not fully sublimated our playful sandbox fantasies, or who mean to satisfy our delusions of omnipotence on the computer stage. Such tasks are extraordinarily demanding and interesting. Robert Oppenheimer called them sweet. Besides, research projects in these areas are generously funded. The required moneys usually come out of the coffers of the military, at least in America.

It is enormously tempting and, in Artificial Intelligence work, seductively simple to lose or hide oneself in details, in subproblems and their subproblems, and so on. The actual problems on which one works—and which are so generously supported—are disguised and transformed until their representations are mere fables: harmless, innocent, lovely fairy tales.

Here is an example. A doctoral student characterized his projected dissertation task as follows. A child, six or seven years old, sits in front of a computer display that shows a kitten and a bear, in full color. The kitten is playing with a ball. The child speaks to the computer system: "The bear should say 'thank you' when someone gives him something." The system responds in a synthetic, but nonetheless pleasing voice: "Thank you, I understand." Then the child again: "Kitty, give your ball to your friend." Immediately we see the kitten on the computer display throw the ball to the bear. Then we hear the bear say: "Thank you, my dear kitten."

This is the kernel of what the system, development of which is to constitute the student's doctoral work, is to accomplish. Seen from a technical point of view, the system is to understand spoken instructions—that alone is not simple—and translate them into a computer program which it is then to integrate seamlessly into its own computational structure. Not at all trivial, and beyond that, quite touching.

Now a translation to reality. A fighter pilot is addressed by his pilot's assistant system: "Sir, I see an enemy tank column below. Your orders, please." The pilot: "When you see something like that, don't bother me, destroy the bastards and record the action. That's all." The system answers: "Yes, sir!" and the plane's rockets fly earthward.

This pilot's assistant system is one of three weapons systems that are expressly described, mainly as a problem for artificial intelligence, in the Strategic Computing Initiative, a new major research and development program of the American military. Over $600,000,000 are to be spent on this program in the next four or five years.

It isn't my intention to assail or revile military systems at this point. I intend this example from the actual practice of artificial intelligence research in America to illustrate the euphemistic linguistic dissimulation whose effect it is to hinder thought and, ultimately, to still conscience.

I don't know whether it is especially computer science or its subdiscipline artificial intelligence that has such an enormous affection for euphemism. We speak so readily of computer systems that understand, that see, decide, make judgments, and so on, without ourselves recognizing our own superficiality and immeasurable naivety with respect to these concepts. We anesthetize our ability to evaluate the quality of our work and, what is more important, to identify and become conscious of its end use.

The student mentioned above imagines his work to be about computer games for children, involving perhaps toy kittens, bears, and balls. Its actual and intended end use will probably mean that someday a young man, quite like the student himself—someone with parents and possibly a girlfriend—will be set afire by an exploding missile sent his way by a system shaped by the student's research. The psychological distance between the student's conception of his work and its actual implications is astronomic. It is precisely that enormous distance that makes it possible not to know and not to ask if one is doing sensible work or contributing to the greater efficiency of murderous devices.

One cannot escape this state without asking, again and again: "What do I actually do? What is the final application and use of my work? Am I content or ashamed to have contributed to this use?"

I am reminded in this context of a well known American journalist who, during a Middle East highjacking, suggested that under certain circumstances the Israelis shoot ten Arab prisoners and, should the circumstances not change, shoot ten more the next day, and so on. He should not have made this suggestion unless he was prepared to go personally among the prisoners and look into the eyes of the men, some of whom would hear him say: "You, you will die today." He should have been prepared as well to hold the pistol to the heads of those he selected, and to command his own finger to pull the trigger.

Just so should we ask ourselves about our own work. Once we have abandoned the prettifying of our language, we can begin to speak among ourselves realistically and in earnest about our work as computer professionals.

"You, colleague of many years, you are working on a machine consisting of two to the fifteenth and more microprocessors running simultaneously. With the help of such a machine, one can first simulate, then construct much more efficient, smaller, and lighter hydrogen bombs. Imagine, for a moment, you were an eyewitness at Hiroshima in 1945; you saw people stripped of their skin die. Would you want to make this happen thousands of times more? Would you so torture a single human being with your own hands? If you would not, regardless of what end would be served, then you must stop your work."

One should ask similar questions with respect to other branches of computer science, for example, with respect to attempts to make it possible for computer systems to see. Progress in this domain will be used to steer missiles like the Cruise and Pershing ever more precisely to their targets, where murder will be committed.

Many will argue that the computer is merely a tool. As such, it can be used for good or evil. In and of itself, it is value free. Scientists and technicians cannot know how the products of their work will be applied, whether they will find a good or an evil use. Hence, scientists and technicians cannot be held responsible for their work.

That point of view is manifested in the world famous Draper Laboratory, next door to the MIT building where I work. Draper is devoted almost entirely to missile guidance and submarine navigation. Many of the scientists employed there argue that the systems they work on can take men to the moon and bring them back, as well as guarantee that missiles aimed at Moscow will actually hit Moscow, their target. They cannot know in advance, they say, which of these two or still other goals their work will serve in the end. How then can they be held responsible for all the possible consequences of their work?

So it is, on the whole, with computer professionals. The doctoral student I mentioned, who wishes to be able to converse with a computer display, does in fact believe that future applications of his work will be exclusively in innocent applications like children's games. Perhaps his research is not sponsored by the Pentagon's Strategic Computing Initiative; perhaps he never even heard of SCI. How then can he be held responsible if his work is put to anti-human use?

Here is where we come to the essence of the matter. Today we know with virtual certainty that every scientific and technical result will, if at all possible, be put to use in military systems.

The computer, together with the history of its development, is perhaps the key example. But we should also think in this connection of everything that has to do with flight, or of things atomic, of communication systems, satellites, space ships, and most of the scientific achievements of the human genius. We may then convince ourselves that in the concrete world in which we live, the burden of proof rests with those who assert that a specific new development is immune from the greed of the military.

In these circumstances, scientific and technical workers cannot escape their responsibility to inquire about the end use of their work. They must then decide, once they know to what end it will be used, whether or not they would serve those ends with their own hands.

I don't believe the military, in and of itself, to be an evil. Nor would I assert that the fact that a specific technology has been adopted by the military makes it, on that ground alone, an evil. In the present state of the evolution of the sovereign nation-state—in other words, in the insane asylum in which we live—each state needs a military just as every city needs a fire department. But no one pleads for a fire station on every corner, and no one wishes for a city fire department that makes a side business of committing arson in villages adjacent to the city.

But we see our entire world, particularly its universities and science and engineering facilities, being more profoundly militarized every day. "Little" wars burn in almost every part of the earth. (They serve, in part, to test the high tech weapons of the "more advanced nations.") More than half of all the earth's scientists and engineers work more or less directly in military institutions, or in institutions supported by the military. That is an evil that must be resisted.

We must also recognize that it is only our already internalized habit of prettifying our language, in order not to arouse our conscience, that permits us to speak in terms of weapons and weapons delivery systems at all, when we are, in fact, discussing atomic explosives and hydrogen bombs. Those aren't weapons, they are mass murder machines and mass murder machine delivery systems. That is how we should speak of them: clearly, distinctly, and without evasion. Once we recognize that a nuclear mass murder is nothing other than an instant Auschwitz—without railroads or Eichmanns or Dr. Mengele, but an Auschwitz just the same—can we continue then to work on systems that steer these devices to living cities?

That is the question I ask. Each of us must earnestly ask ourselves such questions and deeply consider the responses we find in ourselves. Our answers must finally manifest themselves in our actions—concretely, in what we do every day.

Probably the most pandemic mental illness of our time is the almost universally held belief that the individual is powerless. This self-fulfilling delusion will surely be offered as a counter-argument to my theses. I demand, do I not, that a whole profession refuse to participate in the murderous insanity of our time. "That cannot be effective," I can already hear it said, "That is plainly impossible. After all, if I don't do it, someone else will."

First, and on the most elementary level, "If I don't do it, someone else will" cannot serve as a basis of moral behavior. Every crime imaginable can be justified with those words. For example: If I don't steal the sleeping drunk's money, someone else will. But it is not at all trivial to ask after the meaning of effectiveness in the present context. Surely, effectiveness is not a binary matter, an either/or matter. To be sure, if what I say here were to induce a strike on the part of all scientists with respect to weapons work, that would have to be counted as effective. But there are many much more modest measures of effectiveness.

I think it was George Orwell who once wrote, "The highest duty of intellectuals in these times is to speak the simplest truths in the simplest possible words." For me that means, first of all, to articulate the absurdity of our work in my actions, my writings, and with my voice. I hope thereby to stir my students, my colleagues, everyone to whom I can speak directly. I hope to encourage those who have already begun to think similarly, and to be encouraged by them, and possibly rouse others out of their slumber. Courage, like fear, is catching.

Even the most modest success in such attempts has to be counted as effective. Beyond that, in speaking as I do, I put what I discuss here on the public agenda and contribute to its legitimation. These are modest goals that can surely be reached.

But, finally, I want to address such larger goals as, for example:

Ridding the world of nuclear mass murder devices and perhaps also of nuclear power generators.

So reordering the world that it becomes impossible ever again to convince workers of one country that it is a necessity of life that they feed their families on the flesh and the blood and the tears of people of other countries. (That is, unfortunately, the fate of many workers today, and not only those who earn their daily bread in armaments factories, but equally those of us whose daily work is to sharpen high tech weapons.)

So reordering the world that every human being has available to himself or herself all material goods necessary for living in dignity. (I have often heard well-meaning people say that, if we apply technology, especially computer and communications technology wisely, we may reach this goal in perhaps 50 to 100 years. But we can reach it sooner, and without waiting for technological advances. For the obstacle is not the absence of technology, it is the absence of political will.)

I once heard Elie Wiesel say: "We must believe the impossible is possible." I understood that in two different ways. First, had we been able to believe that "the land of the poets and the thinkers" could give birth to human extermination factories, we might not have had to experience Bergen Belsen. The impossible horror proved possible and became reality.

But there is a more hopeful interpretation. It seemed impossible in the America of only 150 years ago ever to abolish the slavery of the black people. The entire economy of America's south was built on cotton. Cotton could neither be planted nor harvested, it was believed, without the unpaid toil of thousands of human beings out of whose wretchedness the plantation master could squeeze his profit. Nevertheless, at first only a few farseeing men and women, dreamers all, in Massachusetts, later many more citizens, came to believe the impossible was possible, that the slaves could be freed and slavery ended.

The impossible goals I mention here are possible, just as it is possible that we will destroy the human race. I alone can neither achieve the one nor prevent the other. But neither can it be done without me, without us.

I have no right to demand anything from my colleagues. But they must know that we have the power either to increase the efficiency of the mass murder instruments we have and thereby make the murder of our children more likely, or to bring the present insanity to a halt, so that we and our children have a chance to live in human dignity.

Let us think about what we actually accomplish in our work, about how it will be used, and whether we are in the service of life or death.

Two Pieces on the Utility of Cybernetics

By Larry Richards (Department of Engineering Management, Old Dominion University, Norfolk, VA 23508). Copyright 1988 by Larry Richards.

1. Star Wars... eh?

Leonard: What about applying cybernetics to SDI—you know, "Star Wars"? This country really needs this technology right now and cybernetics could contribute a lot, I think.

Laurie: Look, Leonard! I have a request: I would like you to grant me an assertion. The assertion is that "I do not want to talk with you about 'Star Wars'." Can you grant me that?

Leonard: But, but... what if I want to talk to *you* about "Star Wars"?

Laurie: The request is not that you do not talk to me about "Star Wars," only that you grant me the *assertion* that I do not *want* to talk with you about "Star Wars."

Linda: But, you should want to talk about "Star Wars.' If you do not talk about it, then it will proceed without you, and the arms race will escalate, and new, more powerful technologies will be developed, and the world will be destroyed.

Laurie: No, no... The assertion is that I do not want to talk with you—Leonard—about "Star Wars." I will talk with Paul about it, and perhaps it can be the chief topic of discussion at the next meeting of...

Lonnie: Excuse me, but aren't you discriminating against Leonard? Shouldn't he have an opportunity to participate in any discussion in which *you* have the opportunity to participate?

Leonard: Yea!! What about that?

Laurie: Of course! That's what assertions do; they discriminate.

Leonard: But why me? You're making me into some form of lowlife by not permitting me to participate.

Laurie: I am not preventing and cannot prevent you from participating. The importance of my request is that I want to separate myself from the politics associated with... no, I must be more specific—I want to separate myself from your politics!

Linda: So, you don't want to talk about politics either?

Lonnie: That's not what she said. All she said was that she didn't want to talk with Leonard about "Star Wars."

Laurie: I would be happy to talk about politics. I don't have any particular urge to do so in this case. I find his politics rather uninteresting. I would much rather talk about assertions, or about my assertion. However, lest I be labeled before I have a chance to label myself, I want to declare that I am *not* a liberal.

Linda: Now I'm really confused.

Laurie: In fact, I find liberalism to be far, far more dangerous than the petty bureaucratic politics surrounding research funding for "Star Wars." I regard liberalism as totalitarianism in the guise of democracy.

Linda: Then, you would prefer not to talk with *anyone* who is getting funding through the SDI program?

Laurie: Not at all. I don't care where people get their funding. If SDI money is available, go for it. I'll even take a piece of it

Lonnie: You don't want to talk with Leonard about "Star Wars," but you don't care if this outrageous technology continues to be developed?

Laurie: If I were to get SDI funding, I would pursue my research driven by the desire to create new possibilities for becoming human and for understanding interactions among human becomings, *and* to explore the society which constrains both of those sets of possibilities. However, I do think there are better ways to go about this than SDI.

Linda: And what if someone is less utopian than you, and is honest enough to admit that she is in fact conducting her research for a client, and the client expects a particular product, and of course to gain some prestige and wealth as a result of the outcome of the research? And, she may not get continuation of her funding if she does not produce these types of results; and, really, she just wants to make a decent living.

Laurie: Then, I must resist, confront, and even *fight* these efforts, for a society that permits, even encourages, such transactions cannot be desirable.

Leonard: Well now, what if I choose not to grant you your assertion?

Laurie: Then, I am afraid I have little further to discuss with you.

Lonnie: And, if he *does* grant you your assertion?

Laurie: Then, we can continue to have discussions on a variety of topics and issues... but, with the understanding that I do not *want* to talk with him about "Star Wars."

Leonard: ... hmmm.

2. Women and Cybernetics... hmmm

Cybernetics: Words and Images

By Paul Schroeder (Fogler Library, University of Maine, Orono, ME 04469). This article is *not* copyrighted.

I am writing in response to Stuart Umpleby's remarks in CC #10 on an "ecology of concepts," and to Greg Williams' request in CC #9 for notes on cybernetic themes which have been under-represented in this newsletter.

Umpleby's observations remind me of a characteristically cybernetical remark: "But, I am not Heinz Von Foerster, one man; I am Heinz Von Foerster, a whole collection of people!" Cybernetics itself is a whole collection of concepts, supported by whole collections of people.

Since I first heard the term over twenty years ago, I have been trying to grasp the meanings of the word cybernetics. The accident of study in Urbana led to my attachment to the people who represent cybernetics. At times I am inclined to think that the term is unfortunate, as when I hear it linked with "cyberpunk" or to the advocacy of space weapons. An alternative has been proposed, *cybernautics—but* we could have

trouble in securing travel funds to attend meetings of "cybernauts."

Because I have not attended recent ASC meetings, I am not in touch with the specific organizational problems which prompted many of Umpleby's remarks. I regret not having been in Urbana in December to hear others' responses. As to constructivism: if that were the whole story, we would be the constructivist society, not the cybernetics society.

Constructivist insights nevertheless seem to be central within this Society (though perhaps not in its cyberpunk and Reaganetics branches). Constructivism is one of the several hinges upon which we can join in affiliation with others who may not now see cybernetics as an element in their own structures of interpretation. (1)

I would like to outline several links between the construction of visual symbols and cybernetics, in two domains: *cybernetic iconography* (a subset of the symbol-system by which cybernetic processes are encoded in discourse), and *cybernetic art* (the spatial demonstration of relevant principles). (2)

First, iconography. Several images, such as the *uroboros,* which is traditional in many cultures, and the "Nuremburg Funnel," which is rooted in a 17th century literary allusion, will be familiar to readers of cybernetics texts. The editor of this newsletter is correctly cautious about rights of graphic reproduction, and I simply offer my own version of the Funnel. (3)
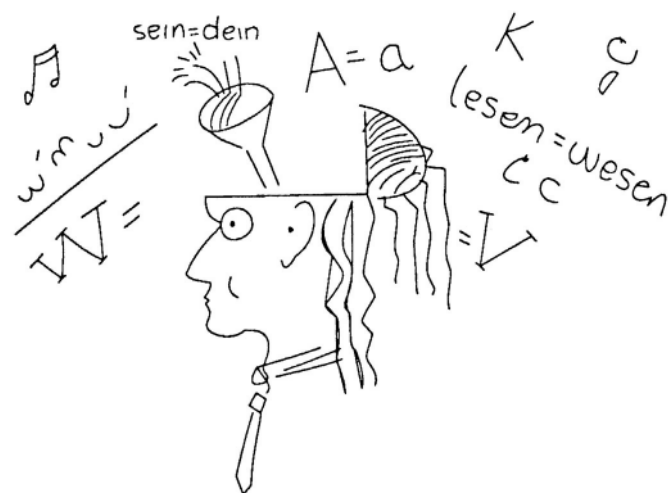
(Redrawn by Greg Williams from a sketch by Paul Schroeder.)

The image illustrates an idea which is elusive when attempted through prosaic descriptions.

The icon of the *uroboros* can be visualized by readers in the absence of a graphic illustration. The meaning of this ancient and universal symbol is not transparent, like the 'Nürnberger Trichter," but rather always evokes paradox in its interpretations. In cybernetics contexts, this symbol first summons technical terms like "recursion," "self-reference," "feedback," and "autonomy," while also reflecting the standing of paradox itself within cybernetic studies. (4)

A third image to be introduced in this context is one which readers may not have yet seen: a small woodcut titled "Progress," made by Eric Gill. At first it appears to be simply a light wooden sailing craft balanced upon the sea. A few fishes and sunbeams thrown in. The title only makes sense when it is noticed that the craft is rudderless, and that there is no one at the helm. (5)

This illustration is appropriate in cybernetics contexts, both because of the "helmsmanship" in which cybernetics is grounded, and the emphasis on purpose and goal which is intrinsic to cybernetic analyses of systems, processes, and events. Cybernetics can be seen as an extended navigational metaphor, within which the constant values to which systems hold are analogous to the land-based beacons and constant celestial observations necessary in traditional nautical practice.

None of these images originated in cybernetics, but they have been introduced as illustrations of qualities central to its perspectives. Several questions can now be raised. Is cybernetics a "new" science? As a discipline conceived as being new, what distinguishes it from other related fields which have sprung up since the second world war, such as general systems theory, ecology, cognitive psychology, operations research, and information science?

Analogous questions emerge related to the traditional sciences from which these symbols have been drawn. Can cybernetics extend to traditions of thought which include Pythagoreanism, neo-Platonism, medieval alchemy, and traditional metaphysics? Following Umpleby's principle of the ecology of concepts (and seeking to avoid errors due to denial of the past), the extents and limits of such connections should be responsibly explored as we would explore relations among more modern disciplines.

There are precedents for such investigations. Two studies relate directly: Manfred Graef's "Toward a Cybernetic Art Corresponding to the Symbols of our Early Ancestors" *(Leonardo* 19(4), 1986, 293-296) and Asaad Nadim's *Testing Cybernetics in Khan-el-Khalili: A Study of Arabesque Carpenters* (Ph.D. Dissertation, Indiana University, 1975). I believe that Kapila Vatsyayan's *The Square and the Circle of the Indian Arts* (Humanities Press, Atlantic Highlands, New Jersey, 1983) can also be included. Though Vatsyayan's work does not explicitly mention cybernetics, her introductory remarks call for a holistic method which would seem to be satisfied by a cybernetic approach.

While Graef's article omits many details about his objectives, he clearly links contemporary techniques of mathematical permutation with the study of Celtic ornament, the establishment of axes of orientation in medieval architecture, primitive celestial observation, and such elementary symbols as the cross and the circle. (6) Nadim examines both the design of arabesque woodwork and the social structure of learning and production in a traditional workshop, using a cybernetic model for analysis. Vatsyayan focuses in a similar way on the ritual enactments of traditional Indian drama and dance.

These studies of the social structure and symbols of traditional performance and craft point to the next question: what are the "cybernetic arts"? A brief search of a leading visual arts online database, *Artbibliographies Modern,* shows at least 60 articles and books on cybernetics and art during the past 12 years. Much of the art which is identified as cybernetic is dynamic, including kinetic sculptures and multimedia instal-

lations. Combining all these themes, it seems that gymnastics, juggling, performance illusion, and the circus would all qualify as "cybernetic arts." (7)

Among the many terms which I frequently associate with cybernetics (mutuality, localization, autonomy, automata, redundancy, connotation, ...), several have common counterparts in everyday speech—puppet for automaton, variety for redundancy, and balance for the more technical "homeostasis" and "equilibrium." Physical balance is a requirement for several of the performance arts listed above, as well as for activities which are taken for granted, like walking erect. (8)

The learning which goes into maintaining this balance has been forgotten by adults, but is always a major issue in infancy. The processes at work are thoroughly cybernetic, founded upon the maintenance of an internal standard which corresponds to an earth-bound reference. This vertical standard (reflected also in our demands for precisely vertical referents in architecture) is itself tied to the earth's axial orientation, fundamental to all navigation up through the modern gyroscope.

We are accustomed to the physical and even psychological senses of the term "balance," but we often overlook the normative implications of the concept, as represented by Justice holding the scales. Early scientific studies of the mechanical balance were undertaken in a climate in which the physical and metaphysical aspects of this subject were both given consideration. (9) It might follow that the emphasis in cybernetics on purpose and goal should lead us into metaphysics, which itself encompasses the "ethical" implications which have already appeared in cybernetics literature. The metaphysical implications of many terms in this discipline may be key to making its central insights and principles intelligible to larger numbers of people.

To summarize what I have stated above: my interest in cybernetics is grounded in encounters with individuals, not only with the ideas they represent; my general interests in traditional culture and visual symbolism are compatible with a cybernetic view; and, the "ecology of concepts" principle advanced by Umpleby is a welcome sign for those like myself who are not working professionally in the mainstream of cybernetics.

I would like to add a few words about my daily work as a reference librarian. The setting is an intensely interactive one, in which widely various questions and conceptual structures must be recognized and evaluated. The communicative problems are challenging.

There is a growing awareness in my profession of structural problems which accompany the assigned tasks of reference librarians. (10) I believe that cybernetic analysis can usefully be applied toward sorting out confusions related to the dynamics of the "reference interview," and also toward revision of the "information access" model which dominates contemporary library practice—a model which in many ways reproduces the antiquated "Nürnberger Trichter," replacing its force-feeding of "knowledge" with a more self-inflicted diet at the information trough. (11)

In closing, I wish to thank those whose efforts have made the forum of this newsletter available to the rest of us.

Notes

1. For example, find several constructivist formulations in Oliver Sacks and Robert Wasserman, "The Case of the Colorblind Painter," *New York Review of Books*, November 19, 1987, 25-34. David Swanson and Jesse Delia's *The Nature of Human Communication* (Science Research Associates, Chicago, 1976) is a straightforward, accessible overview of the constructivist position, with section titles such as "Is Talk 'Thought-Sharing'?," "All Persons in a Communicative Context Are Active,' and "Basic Premises of the Constructivist View of Persons."

2. Readers who are interested in the connections between visual imagery and science should examine the Album of Science series, edited by I.B. Cohen. The most recent volume in this series, *Antiquity and the Middle Ages*, by John E. Murdoch (Scribner's, New York, 1984) is especially related to the theme of this paper.

3. Another rendering, by Robert Osborn, illustrates Heinz Von Foerster's "To Know and To Let Know: An Applied Theory of Knowledge," as reprinted from the *Canadian Library Journal* 39(5), October 1982, in *Cybernetic* 1(1), Summer-Fall 1985, 4755. That text specifies the place of this image in cybernetic thought. My sketch was made to illustrate a query addressed to a network of reference librarians, in an attempt to track down the original broadside. Reproductions have now been located, in Lutz Röhrich's *Lexikon der Sprichwörtlichen Redensarten* (Herder, Freiburg, 1974). My great thanks to Patricia Mardeusz, reference librarian at the University of Vermont, and to Professor Wolfgang Mieder of that university's Department of German and Russian, for finding this text.

4. A detailed examination of this symbol from the viewpoint of Jungian psychology is given in the first chapter of Erich Neumann's *Origins and History of Consciousness* (Pantheon, New York, 1964). While the term "Jungian" is nearly as opaque to me as the term "cybernetics," I found several statements in that text which may both support constructivist views and also encourage Umpleby's desire to transcend narrow constructivist formulations.

5. The illustration appears as the frontispiece in Ananda Coomaraswamy's *Am I My Brother's Keeper?*, (John Day, New York, 1947).

6. Graef's intuitions are reflected in the drawing of Pictish knotwork chosen to illustrate the announcement for the "cyberNET '88" conference, to be held this June. That image is apparently taken from George Bain's *Celtic Art, the Methods of Construction* (Constable, London, 1977, also available in several other editions), redrawn by Bain from the *Book of Kells* (see Plate K, page 54). These knotwork constructions are also reflected in Leonardo's "Concatenations" and Dürer's "Knots," both also found as illustrations in cybernetics contexts, and discussed by Coomaraswamy, "The Iconography of Dürer's 'Knots' and Leonardo's 'Concatenation'," *Art Quarterly* 7, 1944, 109-123.

7. The case for applying cybernetics to circus, acrobatics, and animal training has already been made by Paul Bouissac, in *Circus and Culture, A Semiotic Approach* (Indiana University Press, Bloomington, 1976). Several examples of folk-etymological connections can be noted here, including the classical Greek terms for professional tumblers *(kubistētēr)* and for playing at dice *(kubeuon)*. Ritual performance is likewise reflected in *kubernēsia*, the festival at Athens in memory of the steersman of Theseus' voyage.

8. An issue not only for humans; the line drawings which illustrate lizard balance in V.B. Sukhanov's *General System of Symmetrical Locomotion of Terrestrial Vertebrates and Some Features of Movement of Lower Tetrapods* (Amerind, for the Smithsonian and National Science Foundation, New Delhi, 1974) are illuminating.

9. For early studies of the balance, see Wilbur Knorr, *Ancient Sources of the Medieval Tradition of Mechanics: Greek, Arabic and Latin Studies of the Balance* (Instituto e Museo di Storia della Scienza, Florence, 1982). One of those studies, al-Khazini's *Book of the Balance of Wisdom,* is linked by S.H. Nasr in *Islamic Science, An Illustrated Study* (World of Islam Festival, s./., 1976, 143)to the cosmic balance of Jabir's *Book of the Balance.*

10. See the continuing set of comments in the *Journal of Academic Librarianship,* and in library professional literature generally.

11. I credit my colleague Bryan Goodwin with this term, initially coined as "info-trough" to nickname a popular automated index, InfoTrac (registered trademark of the Information Access Corporation).

Bateson, Peirce, and Heidegger

By Paul Ryan (924 West End Ave., Apt. 42, New York, NY 10025). Copyright 1988 by Paul Ryan.

I liked Philip Lewin's convergence of Bateson and Heidegger (*CC* #11), especially since the route of reference was through Peirce. I liked it because it parallels my own path from Bateson to Peirce to Heidegger.

Dissatisfaction with Bateson's use of logical types, not unlike Krippendorff's (CC #11), lead me from Bateson to Peirce (Ryan, 1980b). Lack of poetry and ontology lead me from Peirce to Heidegger. But despite the poetic delights in Heidegger, I find the same sort of dissatisfaction with Heidegger's ontology as I did with Bateson's epistemology. True, Heidegger's poetics are a "corrective" to Bateson's near positivism, but even taken together, there is difficulty. For me the difficulty is precisely in the "gaps" that reveal and conceal. I fear these "gaps" result in post mortem social mystification of what was healthy mysticism in two unique individuals. To make an extreme statement, in the end, these "gaps" are such that a clever fascist could drive an army through them.

After having made my own foolish rush into the gaps where angels fear (Ryan, 1974), what I've come around to is situating myself in Peirce's tradition, cybernetically. Using cybernetics learned from Bateson and McCulloch, I was able to solve the problem of triadic relationships left unsolved by Peirce. This logic of relationships is a logic of continuity, not discontinuity. "Gaps" can be understood by being embedded in continuity, not as a necessary part of being, only understandable by faith. For example, Thom's discontinuous catastrophe models can be embedded in this logic of continuity.

The Relational Circuit

Figure 1 diagrams this logic of relationships. The two-dimensional drawing presented is a rendering of the three-dimensional form I call a relational circuit.
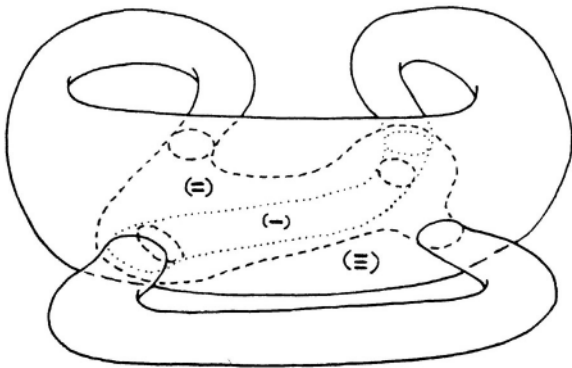
Figure 1. The Relational Circuit

This figure results from taking the relations of position and inclusion that obtain in the topology of a Klein bottle and developing these relations into a circuit. Respecting the circuit's debt to the Klein bottle, I have sometimes called it a Kleinform. A Klein bottle has three related positions: a position neither contained nor containing (the neck of the bottle), a position containing another position (the body of the bottle), and a position contained (within the body of the bottle). In the Klein-form, these three related positions are developed into a six-part circuit with three positions neither contained nor containing (the "handles" on the form, (– =), (= ≡), and (≡ -)), one position contained by two (-), one position that contains and is contained (=), and one position that contains two positions (≡).

The statements that follow are based on observation of the form. In Peirce's language, these statements are abstractive observations. This is a partial list of the characteristics of the form, selected to show how the form satisfies Bateson's criteria for a unit of mind (1979). A fuller characterization can be found elsewhere (Ryan, 1987, forthcoming).

1. *One*

There is but a single form.

2. *Empty*

The form is empty. The emptiness itself constitutes the form.

3. *Continuous*

The form is continuous. It is possible to move from within any part of the form to any other part without crossing a boundary.

4. *Six-Part*

The form penetrates itself six times. This self-penetration yields six different positions on the continuum. Each position is part of the continuum.

5. *Positional*

The differentiation in the form is structured according to differentiation of position on the continuum. In contrast to any statement of description, differentiation in the form does not correspond to the differentiation implicit in the subject/predicate structure of propositions. Hence, the form cannot be fully explained in any axiomatic system of propositions. The form is positional, not propositional.

6. *Unambiguous*

The six positions are unambiguous. There is only one position of firstness (-), only one position of secondness (=), and only one position of thirdness (≡). (For refined observation, thirdness can be described as the position surrounding secondness in which a stiff torus can be trapped. All other positions are differentiated by the passage of the continuum through the thresholds created by the self-penetration.) There is only one position on the continuum between firstness and secondness (- =), only one position on the continuum between secondness and thirdness (= ≡), and only one position on the continuum between thirdness and firstness (≡ -).

The naming of these positions is not arbitrary. Firstness is a compact, empty position—free of any other. Secondness has another part of the form passing through it—something it is up against—the position of firstness. Thirdness contains both secondness and firstness. Firstness, secondness, and thirdness are Peirce's three fundamental categories. Firstness is the cat-

egory of spontaneity, freshness, and originality. Secondness is reaction/resistance—being up against the *thisness* of something. Thirdness is the category of mediation between firstness and secondness—of law, regularity, and habit.

7. *Relative*

The form is absolutely relative. The six positions are completely determined by each other. To move from one position to another position is to change relationship to every other position. A difference in position makes a difference in relationship.

8. *Heterarchic*

Choices between positions within the form operate according to intransitive preference. That is to say, choices are not constrained by a hierarchy, but can operate heterarchically. If I outline the form on the floor and stand in the position of firstness (-), I can move through an "inbetween" position (- =) to the position of secondness (=). But once in secondness, I am not compelled to move to thirdness (E), as if there were a fixed hierarchy of preference or choice. I can return to firstness (-). Any position in the form allows this pattern of intransitive preference. There are always two choices, and no choice compels an irreversible sequence of hierarchic choice.

The format I will use to demonstrate that the form is a mental circuit proceeds as follows. I will state each criterion of Bateson (1979), and then describe how the circuit satisfies that criterion by referring to the characteristics established above.

1. *A mind is an aggregate of interacting parts or components.*

The form has six parts or components.

2. *The interaction between parts is triggered by difference.*

The form is relative. A difference in position makes a difference in relationship. Any interaction between parts takes place in terms of these positional differences. Hence interaction between parts is triggered by difference.

3. *Mental processes require collateral energy.*

The form is empty. The form can be likened to a six-part zero. It is empty of energy. Processing of differences in the form requires collateral energy.

4. *Mental processes require circular (or more complex) chains of determination.*

The form is a continuum. The continuum is a circular chain determining unambiguous differences.

5. *In mental process, the effects of differences are to be regarded as transforms (i.e., coded versions) of the differences which preceded them.*

Each difference in position is, in effect, a transform from the preceding position or positions. This can be made clear by referencing a design for a television channel dedicated to monitoring the ecology and developing consensus about how best to live there (Ryan, 1987). This channel uses the relational circuit and the 66-fold sign classification Peirce exfoliated from his categories. If we map Peirce's semiotic understanding onto the positions in the relational circuit, we get the following: the sign maps onto firstness, the object onto secondness, and the

interpretant onto thirdness. The television ecochannel provides programming (sign) about the ecology (object) for the people who live in that ecology (interpretants) so they will not destroy it (ground of the sign). Differences in the ecology (object, position of secondness) make differences in the programming (sign, position of firstness), which make differences in the interpretation of the ecology (interpretant, position of thirdness), which in turn make differences in the ecology itself (object, position of secondness). Each difference in position is, in effect, a transform from the preceding position.

6. *The description and classification of these processes of transformation disclose a hierarchy of logical types immanent in the phenomena.*

While the heterarchic form itself cannot be subsumed by a hierarchy (Ryan, 1980b), transformations in the form can be described so as to disclose a logical typing immanent in the form. Firstness is at a "lower level" of logical typing than secondness. Secondness is at a "lower level" than thirdness. Moving from "level" to "level" is a transformation of relationships.

Now what of Heidegger? This is where I hope other readers of *CC* can be helpful. Is reading Heidegger through a Batesonian lens a kind of mistake? I like Heidegger, I want the Ontology he promises, but...

Like Peirce, Heidegger studied Duns Scotus carefully. But where Peirce developed his three fundamental categories of being, partly to accommodate the "thisness" of Scotus in his category of "secondness," Heidegger did not go triadic. Heidegger stayed with the One and the many, Being and beings. When a society sees the many in terms of the "One," some social hierarchy of classes—full of gaps—seems the unavoidable result. This is where I see Heidegger and Bateson converging. Is Heidegger better than that? Is Bateson better than that? Am I missing something?

So I suspect the Heidegger/Bateson convergence as prologue to mystification. What Heidegger calls thinking appears an attempt to initiate a new philosophy outside the cybernetic closure of philosophy. In Batesonian terms this may be a proper corrective, but it also seems to concede that mind can now open a new chapter of transcendence. Is not one of the canons of cybernetics that mind is immanent? (How do gaps square with immanence?) Perhaps Heidegger's statement of philosophy ending in cybernetics is a tactical concession to buy time for more transcendence. In Peircian terms, Heidegger's "new philosophy" belongs to the realm of firstness, not transcendence. I think a cybernetic philosophy that genuinely incorporates Peirce need not exclude the poetics of Heidegger, and may well develop a robust ontology. Peirce approached metaphysics as an experimental science. Heidegger is a class A metaphysical scout. His understanding might be incorporated into a Peircian cybernetics. If you go triadic with Peirce, a social hierarchy with transcendent mystification seems avoidable; a different kind of society, based on a heterarchy of relationships, seems possible (Ryan, 1980a).

References

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P. Ryan, 1980b, "A Metalogue," *All Area* 1(1), 47-69.

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P. Ryan, forthcoming, "A Sign of Itself," *Semiotica.*

Setting the Record Straight

By Michael Hyland (Department of Psychology, Plymouth Polytechnic, Drake Circus, Plymouth, Devon PL4 8AA, UNITED KINGDOM). Copyright 1988 by Michael Hyland.

Tom Bourbon (*CC* #11) provides a rebuttal of my earlier contribution (*CC* #9), which is based on a misinterpretation of my position. I wish to set the record straight.

Bourbon says: "Hyland speaks of Bill Powers as a mere maker of paintbrushes, whose work is inferior to that of a painter of masterpieces (by implication, Hyland would be such a master) and who should never even try to paint." What are the facts?

First, my analogy of a maker of paintbrushes (I never used the word "mere") comes from Powers' own writings. He wrote (1984, page 358): "Professor Hyland has used my work in a way that any theoretician would take as the highest of compliments... I am a tool-maker, not a psychologist. My work is useful only if it is used; otherwise it is an empty exercise."

Second, the suggestion that being a "mere" maker of paintbrushes is inferior to painting masterpieces is Bourbon's, not mine. Personally, I see the makers of tools and the users of tools as having complimentary roles. Perhaps Bourbon would have been happier if I had used the analogy of violin maker and player of violins. Or perhaps I should have used an industrial analogy where, for example, the makers of tools which make cars have a more crucial role than the people who use those tools to make cars.

The control theory tool which Powers has advocated is by no means a small contribution. I believe it to be an excellent and crucial tool in the scientific development of psychology. I agree with Powers (*CC* #11) that much of current psychology is based on another and possibly wrong model (or tool). However, the reason, I have argued, why control theory has had less impact in psychology than it should has been because of the weakness of its applications, not because of any weakness in the tool. There are, however, several papers published within the last year which indicate that that lack of impact may be changing. The idea that goal-oriented behavior can be understood in terms of a comparison between a reference criterion and perceptual input is becoming more commonplace.

Third, I object to Bourbon classifying me as someone who is in the anti-control theory camp. On the contrary, I use control theory myself, and yes, because I am not a tool maker, the only option for me is to be a tool user and to try to paint masterpieces. However, I do not belong to that group of individuals (should it exist) who believe that control theory is "right" and everything else is "wrong." I think we all have a little bit of rightness and a little bit of wrongness in our theories, sometimes more and sometimes less. And that is how it will always be.

Finally, let me reiterate a point I made before (*CC* #9). In any application, control theory provides the form of a theory, but not its content. Some of the criticisms which Bourbon is reacting to (e.g., concerning ugliness) are criticisms of content, not of form. I agree with those criticisms, but think them largely irrelevant to control theory as a tool. The criticisms are rather like saying "I don't like the use of the equals sign in equations because people use such nasty numbers" or "I don't like probability theory because it is relevant to gambling and I disapprove of gambling."

On the other hand, I disagree with those criticisms which are patently a misunderstanding of control theory and which Bourbon discusses. In addition, there is one he missed. The assertion that control theory is quantitative and hence reduces people to numbers is silly. Control theory is not purely quantitative. There is always a qualitative aspect to it, in that a reference criterion can only be described qualitatively. Furthermore, there are a few instances in the literature where the form of control theory is used as a qualitative model rather than as a quantitative model for theory construction—the difference being that when used quantitatively the theory requires a more precise measure of variables than when used qualitatively.

Dear Bourbon, don't be so touchy. And don't make the mistake of thinking that anyone who disagrees with you must be against everything you believe in. People use control theory in different ways.

Reference

W.T. Powers, 1984, "Interactionism and Control Theory," in J.R. Royce and L.P. Mos, editors, *Annals of Theoretical Psychology*, Volume 2, Plenum, New York.

Demonstrating Control Theory

By Charles W. Tucker (Department of Sociology, University of South Carolina, Columbia, SC 29208). Copyright 1988 by Charles W. Tucker.

In this paper I present the procedures that I have used in classrooms and conferences for demonstrating Powers' control theory (Powers, 1973). These procedures are derived from his discussion of experiments (Powers, 1973, 241-244). I have modified them only to the extent that I have written explicit instructions to be used by the demonstrator and a volunteer. I have found the demonstration to be a powerful tool for explaining the fundamentals of control theory. I will present the demonstration exactly as I have done it and mention some implications and possible modifications at the end of this paper.

Materials

This demonstration requires: (1) six sheets of poster paper; (2) twelve 6" pieces of masking tape, to attach the poster paper to a smooth wall or chalkboard; (3) two short pencils of different colors (I have used black and red); (4) two large rubber bands tied together with a knot; (5) a marking pen; and (6) 5" x 8" index cards with instructions. An easel with a pad could be used instead of the poster paper.

Introduction

I think it is very important to get the members of the audience or class involved in the demonstration, so I begin by reading this statement from an index card: "I will, with the help of another person, perform a series of demonstration exercises to illustrate the basic principles of Powers' control theory. The demonstrations are slight modifications of those found in the book *Behavior: The Control of Perception.* I want all of you to take part in these demonstrations. It will not be useful to you unless you do take part. For each demonstration, I want each of you to watch and listen to the volunteer, and answer the question: What instructions or directions is he/she using to perform the movements in this demonstration? The volunteer will be asked to read and follow some directions, and your job is to figure out what instructions are being followed by him/her. I will give you a sheet of paper to write your answers on after each demonstration."

Then I hand out a single sheet of paper to each person, which states:

CONTROL MODEL DEMONSTRATIONS

INSTRUCTIONS: There will be six different demonstrations of a control model. For each demonstration, answer this question about the volunteer: WHAT INSTRUCTIONS OR DIRECTIONS ARE BEING USED TO PERFORM THE MOVEMENTS IN THE DEMONSTRATION? You must watch each one carefully and answer the question for each demonstration after it is completed and before the next one begins. THANK YOU.

DEMONSTRATION I

The instruction(s) used by the volunteer is (are): _____ _____.

The remainder of the sheet has a separate question for each demonstration.

Beginning the Demonstration

I begin the demonstration by reading this statement from a card: "I want someone to volunteer for some demonstration exercises. It will not be harmful to you, and all that is required is that you can read and follow directions. If you wish to volunteer, please raise your hand." I then motion to one of the persons with a raised hand to come to the front of the room, while I say "Please come to the front of the room." Then I say "Thank you for volunteering." I introduce myself (if necessary) and have the person introduce himself/herself to me. Then I say "Please take these cards and read the top one and follow its directions." I then hand the volunteer a stack of index cards with printing on them.

The Exercises

The first card in the volunteer's stack states: "DEMONSTRATION EXERCISES—MOVE THIS CARD TO THE BACK OF THE STACK AND READ THE NEXT CARD."

The statement on the next card is: "There are several cards, each containing a different set of directions. Read each card carefully before doing the exercise. I will ask 'Do you understand?' and you should say 'Yes' or 'No.' If you say 'Yes,' I will ask 'Are you ready?' You say 'Yes' or 'No.' If you say 'Yes,' we will do the exercise. Now move this card to the back of the stack and read the directions on the next card."

The next card states: "MOVE THIS CARD TO THE BACK OF THE STACK AND READ THE NEXT CARD."

The next card states: "EXERCISE I—In this exercise, you will be given a pencil. Take it in your hand and place it on the paper, holding it steady until you are asked if you are ready. When you are ready, you will move the pencil so that you draw the *same* diagram that I am drawing. Do this *at the same time* that I am drawing my diagram. Move this card to the back of the stack when you understand this exercise."

While the volunteer is reading this card, I take a sheet of poster paper, write 'I' in its upper right-hand corner with a marking pen, and tape it to the wall or chalkboard with a piece of tape on each corner. When the volunteer moves the card, I say "Do you understand?" If the volunteer says "No," then I say "Please read the card again." After the volunteer has read the card, I again ask "Do you understand?" I repeat this until the volunteer answers "Yes." (I have not had to ask a volunteer more than once to reread a card.) After the "Yes" answer, I give the volunteer a black pencil and I take a red pencil. The different colors allow the audience to distinguish between my drawing

and the volunteer's. I then ask: "Are you ready?" and when the volunteer answers "Yes," T say "Let's begin."

Standing in front of the poster paper, I slowly begin to make a drawing from an index card without letting the audience or the volunteer see the card. Although my drawing is complicated, it need not be for the demonstration. I try to have a drawing that has straight, sawtooth, and curved lines. I make the drawing about a foot square.

I begin with a vertical line, then make a 90-degree horizontal line, and then several squares which do not overlap. These are followed by several arcs and a sawtooth line, another horizontal line, another vertical line, concluding with an s-shaped line. The drawing is done at a slow pace, and none of the lines repeat the same path, although they do intersect one another. When I finish my drawing, I remove my pencil from the paper, turn to the audience, and say "Please answer the question on your answer sheet for Demonstration I." Then I turn to the volunteer and say "Please read the next card."

The next card states: "MOVE THIS CARD TO THE BACK OF THE STACK AND READ THE NEXT CARD."

The next card states: "EXERCISE II—In this exercise, you will take a pencil in your hand as you did in Exercise I and hold it steady on the paper until you are asked if you are ready. When you are ready, you will move the pencil in the *same directions as my pencil, always keeping your pencil at a distance of one foot (12") and on the same level or same plane as my pencil.* Keep your pencil on the paper at all times. Move this card to the back of the stack when you understand what you are to do in this exercise."

While the volunteer is reading the card, I remove the poster paper for Exercise I from the wall or chalkboard and put up a new sheet marked "II." Then I ask the same questions that I did for the first exercise, and I stand in front of the paper when the volunteer is ready.

For Exercise II, I make the same drawing as I did for Exercise I. When I complete the drawing, I ask the audience to answer the question for Demonstration II, and then say to the volunteer: "Please read the next card."

The next card states: "MOVE THIS CARD TO THE BACK OF THE STACK AND READ THE NEXT CARD."

The next card states: "EXERCISE III—In this exercise, you will take the pencil in the same hand as in Exercise II, but you will place that hand through a rubber band. Always hold the pencil on the paper so a mark is made by it. I will place my finger through the other rubber band and then on the paper. *Watch the knot between the rubber bands, and always keep it on the same 'spot' or place on the paper.* The knot will move, but keep it in the same place. Move this card to the back of the stack when you understand."

While the volunteer is reading this card, I remove the paper and replace it with another sheet marked "III." Then I ask the familiar questions of the volunteer about his/her understanding. I show the volunteer how to hold the pencil and the end of the rubber band at the same time, and then I stand in front of the paper with my pencil, and begin my drawing.

My drawing for this exercise is quite different from that in the previous exercises. Again I have it on a card, and I look at it while drawing. I begin with a vertical line, then make a right angle with a line toward the volunteer, then make another right angle with a vertical line, and then a horizontal line. I follow these with several arcs, then a horizontal line toward the volunteer, ending with a vertical line and an s-shaped line. I remove my pencil from the paper when I finish my drawing, and I say to the volunteer: "Please read the next card." I then ask the audience to answer the question for Demonstration III.

The next card states: "MOVE THIS CARD TO THE BACK OF THE STACK AND READ THE NEXT CARD."

The next card states: "EXERCISE IV—In this exercise, you will hold your pencil on the paper in the rubber band as you

at all. I make my movements in such a way as to keep the knot within the circle at all times. The difference between the drawing for Exercise VI and those for the previous two exercises is usually quite noticeable. Many members of the audience say that the volunteer was confused or made an error. But this exercise is important to illustrate that a reference state (certainly at the higher levels) can be specified as a "range" where a variety of actions can occur before any negative feedback is noticed by the person.

You may think of other ways to treat these diagrams. Remember, even if the volunteer does not use the reference state that is specified in an exercise, he/she will use *some* reference state. In most instances, it is rather easy to determine what the volunteer controlled for in an exercise. I have rarely been wrong when I have guessed the reference state of a volunteer in these exercises.

These exercises, although clearly borrowed from Powers, have some distinct advantages over his for instructional purposes. These exercises provide: (1) a record (trace) of the movement behavior of both the demonstrator and the volunteer, and thus offer the possibility of precise comparative measurement; (2) reference state instructions are known only to the demonstrator and the volunteer, not to the audience, which takes away the "obviousness" or "oh sure" audience response; and (3) the use of different exercises allows a comparative approach to control theory.

Possible Modifications

One could use a clear plastic board with clear plastic sheets for drawing, allowing the audience to see both the demonstrator and the volunteer from the front. Or a computer and a large screen could be used with a program which would make the drawings while the volunteer was following the instructions by using a joystick. This procedure would also allow for precise measurement of the volunteer's movements, with a printed record of the drawings. I am sure that other modifications could be made to increase the utility of these exercises.

A Note on Utility

It should be clear from this paper that I do have a bias toward theories or models which are useful. I simply search for theories that I can use to solve my problems. I have always done this in so-called "everyday" life, and I have a difficult time separating theories of social life from those of everyday life. I find questions which imply that utility is a question to be strange because it seems so obvious to me that theories or ideas which are not useful to someone for some problem will simply be ignored. I suppose if someone invents a theory that is useless, there is nothing to stop him or her. For me, the appeal of cybernetics, especially as control theory, is its utility.

Reference

W.T. Powers, 1973, *Behavior: The Control of Perception,* Aldine, Chicago.

1988 Meetings of the American Society for Cybernetics

June 15-19, 1988, University of Victoria, British Columbia, CANADA. Theme: "Intelligent Networks—and Beyond..." Cosponsored by the Pacific Region Association for Telematics. Some of the activities planned for the conference include a salmon barbecue (in lieu of a banquet), CyberFest at the Provincial Museum, special exhibits, lectures and performances, and opportunities to engage in conversation with many people who have not previously attended an ASC meeting, but who are highly curious about what is going on in cybernetics. A preconference workshop on "An Introduction to Cybernetics" is planned for Tuesday, June 14th; a separate fee will be charged for this event. Papers will be electronically posted, and on-line conferencing will be encouraged both before and during the conference. The University of Victoria is providing accommodations at U.S. $16 per night for room and breakfast or U.S. $25 for room and full board. For further information, call Mary Ransberry at (604)721-8465, or write to: cyberNET '88, Conference Office, University of Victoria, P.O. Box 1700, Victoria, British Columbia, CANADA V8V 2Y2.

October 18-23, 1988. A conference on "Texts in Cybernetic Theory" is tentatively planned. We are trying to make arrangements at a camp in central California. The theme and structure of this conference are still being formulated. The current idea is to engage in serious study of selected works by key figures in cybernetics. Each day would be devoted to reading, examining, questioning, and discussing specific texts (which would be distributed ahead of time). The intent is to promote deeper understanding of some of the major points of view in cybernetics. The final day would engage the authors of these texts in dialogue and discussion of issues that had emerged in the previous days. For more information, contact Rodney Donaldson, P.O. Box 957, Ben Lomond, CA 95005 (phone 408-338-9057).

Second Special European Conference of the American Society for Cybernetics

March 27 to April 1, 1989 at the University of Amsterdam

Theme: "Support, Society, and Culture: Mutual Uses of Cybernetics and Science"

The theme derives from our strong conviction that a growing and yet resolvable problem exists in many notions and uses of science, especially in relation to cybernetics (more particularly, second-order cybernetics), as experienced in the study of how they support society and culture. This relationship has rarely been explicitly examined for its character and the benefits and difficulties deriving from it. It is held that, while both science and cybernetics continue to make valuable contributions, these contributions are not always as mutually beneficial and supportive as they might be—the use they make of each other is often, unfortunately, better characterized as abuse—and that there is much lacking in their synergy: in brief, there is degradation as well as celebration.

Participants will be invited to consider this theme, both in the light of their personal experience of social and cultural support systems, and through analysis of the consequences of differences exhibited between cybernetics and science at aspirational, philosophical, methodological, technical, and tool-application levels. Thus, we will be, in a manner of speaking, writing the history of the future.

While the conference will, naturally, permit the conventional presentation and publication of papers, our aims do not lie, primarily, within this arena. Rather, we look to create an occasion for participants to celebrate by learning and teaching, talking, creating, designing, description-giving, and reporting together. To help catalyze this, it is our intention to invite several scholars to present short, provocative position papers some time in advance that may act as both primers and focusers for events and contributions to develop around, mainly, the themes they have isolated.

Using up-to-the-minute computing facilities, it will be possible for transcripts to become available during the progress of the conference, so that participants may amend and/or clarify the texts. This material will then form the basis of *a* cooperative book that reflects the development of the theme in the discussions during the conference.

The conference is supported by the University of Amsterdam Institute of Andragology, where the direction is organized and based; the Dutch Systems Group; the American Society for Cybernetics; and the Cybernetics Society, London.

Direction of the conference lies initially with the Chairpersons, Dr. Ranulph Glanville (University of Amsterdam and Portsmouth Polytechnic) and Prof. Dr. Gerard de Zeeuw (University of Amsterdam).

A Preliminary Announcement will be published early in 1988, and mailed through contact lists and other conventional sources, but all those who might be interested are invited to contact the conference coordinator to make sure their names appear on the mailing list, and for further information as it becomes available: Ms. Joop Muller, Coordinator, Programma Ondersteuning, Overleving en Cultur, IWA, Grote Bickersstraat 72, Amsterdam 1013 KS, THE NETHERLANDS; phone Amsterdam (20)525-1250.

4th International Conference on Systems Research, Informatics, and Cybernetics

August 15-21, 1988 at the Convention Centre-Congresshouse, Baden-Baden, WEST GERMANY

Sponsored by the International Institute for Advanced Studies in Systems Research and Cybernetics and the Society for Applied Systems Research

The conference will provide a forum for the presentation and discussion of short reports on current systems research in humanities, sciences, and engineering. Specialized symposia will focus on research in computer science, linguistics, cognitive science, psychocybernetics, synergetics, logic, philosophy, management, education, and related areas.

The aim of the conference is to encourage and facilitate the interdisciplinary and transdisciplinary communication and cooperation among scientists, engineers, and professionals working in different fields, and to identify and develop those areas of research that will most benefit from such cooperation.

For additional information, contact: Dr. George E. Lasker, Conference Chairman, School of Computer Science, University of Windsor, Windsor, Ontario, CANADA N9B 3P4 (before June 10, 1988); Dr. George E. Lasker, Hauptpostlagernd, 7000 Stuttgart, GERMAN FEDERAL REPUBLIC (after June 10, 1988).

1st International Congress on Systems for Development

September 19-22, 1989 in Murcia, SPAIN

This meeting is being sponsored by the Spanish Society for General Systems, and will study problems of human development in the framework of systemic perspectives, covering topics such as the following: Global Development of Human Beings, Systemics and Development, Education for Development, Informatics and Cybernetics for Development, Information and Documentation for Development, Artificial Intelligence and Development, Systemics and New Forms of Employment, Dynamic Systems and Modelling for Development, Planning and Optimization for Development, Bases for Integration of Conflicting Systems, and Scenarios for Future Societies.

Inquiries should be directed to: I Congreso Internacional SESGE, Escuela Universitaria de lnformática, Universidad de Murcia, Santo Cristo 1, 30001 Murcia, SPAIN.

IF YOUR ADDRESS IS CIRCLED IN RED, PLEASE RENEW IMMEDIATELY. NO SEPARATE RENEWAL NOTICE WILL BE SENT!

Continuing the Conversation

A Newsletter of Ideas in Cybernetics

Dear Greg,

I've been re-reading the latest CC and thinking more about "useful" in relation to cybernetics, not as "desk accessory"; not as "utility" in the sense of "your utilities are covered by the rent"; not as "utilitarian"; not as something remote from aesthetics—but as if cybernetics were a pomegranate, as full of juice, nourishment, and seeds as it can hold, and I were an explorer-botanist-artist-gardener-cook newly come upon this fruit.

There! That's the first analogy that has ratified me. The first six letters I attempted to write to you last February about cybernetics and its usefulness all employed, or attempted to employ, metaphors that broke down in one way or another. This new one satisfies me in that I see pomegranates as exceptionally beautiful fruits, flowers, and trees. I like all the mythic overtones that are introduced into the conversation with its name. I especially like the way this new metaphor personalizes the conversation by introducing "an explorer-botanist-artist-gardener-cook" who may be personalized by each of us, just as we each personalize our use of cybernetics and pomegranates.

My personalized use of cybernetics was referred to in my letter you printed in CC #12, but not elaborated on except in bits and pieces in the six unsent letters. Those bits and pieces have been put through the juicer, so to speak, to make a kind of

Pomegranate Extract

By Irene "K" Staats (30 Winchester Canyon, #68, Goleta, CA 93117). Copyright 1988 by Irene Staats.

By the time I was thirteen, I had been a member of two dozen or more "family" groups, and countless "social" groups. The questions I wanted answered were: "Why can't men and women, women and women, men and men get on together? Why all the misunderstandings, the leavings, the terribly cruel behaviors?"

I had been raised around (not "by" so much as "around," and "in the presence of') three generations of suffragist feminists of all sizes and shapes, whose socio-political convictions ranged widely all over the maps that were then in existence. Very few of them appeared to me to be "liberated," although they thought of themselves as "emancipated." Most of them appeared to me to dominate the men around them.

In ninth grade, when we were asked to write a paper on the career of our choice, I wrote a paper on marriage and raising children as a career. No one I had observed at that date seemed to be giving either undertaking sufficient consideration. The result of my declaration of intent was a "serious talk" initiated by Teacher, who was disturbed that "such a bright girl should have no larger aspirations." She must have found our exchange disturbing, for the next thing I knew, I had been called before the Dean of Girls for a talk about this distressing, aberrant position of mine. (The year was 1944. It was a "progressive" school district—95% of the graduates went on to college, many on scholarships to prestigious institutions; the faculty was composed of a minority of dedicated men, and a majority of high-minded Deweyite feminists who had read their William James.)

The selves that were assembled by me did not have a generous overview of my adults and the difficulties they were facing. Those ungenerous views were all reinforced by me one night when the Dean of Girls met with me and the Grandmother with whom I was then living for a conference to discuss, not my paper, but their responses to my paper. I can see now that it must have looked to them as if I were throwing away everything they had worked for... all the "liberated" and "emancipated" and "free to become whatever you aspire to" material that was the heart of the matter to them.

Back then, it was clear that the Dean had called my Grandmother at her office. They had discussed me and the offending paper behind my back, and had gone to the trouble of arranging this gala get-together for a Kay-on-the-carpet affair. One way and another, the burden of their songs was "Why are you doing this to us?" and its refrain was the plaintive, familiar, "You're such a bright girl, surely you want more than that?" They didn't want to hear my reasons for thinking myself not-bright. (Multiple selves seemed essential to me for getting on well in endlessly multiplying environments, but the style of the day was to talk as if each person was a single-faceted-same-over-time unit).

However, my Mother had written verses about her Mother both as Mother and as Friend. The contrasts portrayed in those lines were striking. I had no difficulty seeing what she was describing. The difficulty was that I had my own views of all my grownups in their differing guises, and no one of us was prepared or able to discuss either my Mother's distinctions and observations, or mine, or their own (*discuss,* as in converse, explore, talk about this way, talk about that way, argue about in order to clarify, etc., etc.). When attempts at discussion were made, they ended in shouting matches, tears, drunken rages, or leave-takings.

When I read *The Human Use of Human Beings* for the first time in 1952, at age 22, I was quite certain that I knew, first hand, many varieties of uses inhuman, unhuman, too predictably boringly human. I had observed various coalitions of adults attempt to coerce and control other individuals and coalitions. I had observed both coalition changes and subtle subject matter changes. I had read many accounts and had listened to commentators of all stripes giving their accounts of the rights and wrongs of what some of them called "Man's inhumanity to Man." But I didn't know how to use what I was reading in Wiener's book. I only knew to watch for a reappearance of the unforgettable new word. I only knew to watch for others addressing what seemed to me to be similar themes.

"Cybernetics" re-entered my world in 1957, in connection with the name "Gregory Bateson." I began listening to Gregory indirectly when a graduate student of his at Stanford, who was also a friend of mine, began telling Bateson stories. Later, my friend gave me what I always think of as "The Double Bind Paper." Reading it, drinking it in, re-reading it aloud to anyone who would listen started a long, long lover's quarrel (to use Robert Frost's most apt phrase) with the Batesonian Universe. (I also spent another day-that's-been-turned-into-a lifetime listening to Frost at Stanford. There were many aspects of Bateson and Frost that I came to regard as similar and deeply

endearing. They both wear very well. The full line from Frost is "Say that I had a lover's quarrel with the World." Like Warren McCulloch, he "wept, but never walked out.")

The clearly articulated idea of individual as World, as Universe, as immense evolving coherent unity, came when Heinz asked me, "Vy du yu vant too underschtand ze Paskian Uneeverse?" That was a legitimate question. I hooked myself right in and began to see if answers might be fished out of the "deep" that Gordon referred to in a note he wrote to me in 1976.

Sitting here at my Macintosh, looking directly at an "outward and visible sign" of my use of cybernetics, my head is shaking in wonderment, my mouth is curled in the widest of smiles as I think, "Once upon a time, a Universe came into being as a person hunted for answers to questions by following a trail marked out by a collection of words: 'cybernetics', 'human beings', 'anthropology', 'poetry', 'emancipation/liberation/freedom', 'architecture', 'landscape design', 'house/ home/shelter', 'mathematician, 'story', 'marriage', 'patterns, 'relations', etc., etc., as if they were seeds in a pomegranate, each capable of growing into an independent source."

The self who was so taken with The Double Bind Paper hadn't grasped that answers can be seen to be stories, poems, and plays. Where that self lived, there were flocks of what I now call Wildean Words flapping and wheeling around the skies of that world. There were terrifying more-than-words. There were phrases, shapes, scenes, sequences—any one of which might suddenly transmogrify to become what that self called "A Double Bind Bird." She hated and feared that ghastly bird, so we conspired with her to use her understanding of cybernetics and The Double Bind Paper to see what could be done to change that unwelcome, undesired state of affairs. ("We" refers to selves that were talking about these issues.)

Our conjecture (we would not have dignified it with such a name in those days) had to do with turning around those "necessary conditions" which Gregory had described. "If that is indeed what constitutes a Double Bind, then deliberate thoughtful reversal might undo particular binds, get rid of that awful Bird. Let's see..." is essentially what we said. It was an experiment, but we did not dignify it with that word either. We just lived it, wrote it up at long last, and called it "The Double Bind Story."

Learning to write (undertaking a new role, a new self) started after I read *Our Own Metaphor* and took Gordon's description of human beings (an application of cybernetic theory to the behavioral sciences) as a description that could be developed, i.e., constructed, into a useful self.

Over time, using this definition did away with negative perceptions of multiple selves as if they were 'liars" or "schizy bits." Slowly these selves came to be seen as vehicles for "conservation and replication," in the sense I believe Maturana and Varela employ when they are using that phrase.

When I read *Conversation, Cognition, and Learning*, I assumed that my use of "selves" was the equivalent of Gordon's use of "role," "characterization," or "psychological-individual." Making that assumption changed my perception of what it was that I was attempting to conserve and replicate. A more respectful, more exciting view of me and you and us came into being. That view presented each of us as representative of the idea of requisite variety in regard to the ways we may learn to develop new roles, new psychological-individuals, new selves that may serve both the unfolding I and the social fabric.

The experiment might well have come to nothing if I had not started keeping notes. It might never have occurred to me that I wanted, or needed, to learn, not just "to write," but to "put fresh words to my own observations," as Frost advised his daughter. It might never have occurred to me to use Frost's words to Leslie as a guide for learning to write had it not been for the dialogue I started with the Gordon

I imagined behind his words as presented to me by Mary Catherine. That dialogue continues, for, as Paul Pangaro has said (and I heartily agree), "We can never know when we have enough Gordons.

Henry James said, "Never say you know the last word about any human heart." My paraphrase is: "Let us imagine ourselves and others as evolving Universes impossible to know fully; i.e., as wonderfully complex systems." So far, that's proving a useful, i.e., aesthetically satisfying, assumption... a cybernetic assumption.

Well, I could continue the saga of "Uses to Which I Have Put My Understanding of Cybernetics as an Artful Science," but I'm sure I've said enough to indicate just how come my answer to the question "Is cybernetics useful?" is in the affirmative: I use cybernetics. Not as the fulcrum that William Powers says Control Theory has been for him, but as what I take Ernst von Glasersfeld to indicate with the phrase "a way of thinking"—about you and me and conversations and the things that pass for conversations, like the Dean-Grandmother-Kay scene referred to above. Shades of *The Way of All Flesh!* Each of us recognizes the corner of that terrible sofa in the drawing room when we know we're there. I don't need to move the world; I sometimes need, and choose to move or bring into being, an additional me.

The utility question continues open and legitimate, as I see it. I doubt whether it can ever be answered fully and completely by anyone engaged in using cybernetics as a way of thinking. That means to me that it is one of those lovely questions belonging to the set engendering Ever More Beautiful Questions.

Whose Utility?

By Michael Luke Aitken (Box 172, Honaunau, HI 96726). Copyright 1988 by Michael Luke Aitken.

Utility is a filter (or maybe a metafilter), a context through which to order information. Bateson and Timothy Leary both attest to the value of being able to smoothly shift contexts as a situation requires. The perception of a situation that emerges after viewing it through two or three different contexts—utility, aesthetics, will it play in Peoria—is different in a nonadditive way.

Evaluating the aptness of utility (the utility of utility?) approaches metalogue and the limits of our language as well. Utile to whom? It all depends on the audience. If cybernetics studies can't be shown to lead to a digital watch equivalent, a whole lot of people lose interest. If you restrict the discussion to true believers and devoted students, then the issues turn on how our academy supports itself. If the information has no utility, then the devout must hustle the pyramid game, selling their teaching of useless (but interesting) information to an ever-expanding pool of prospects.

If this association with the body of knowledge could in some way be found to lead to a cash flow, why then the academy becomes self-supporting and at the same time enriches its understanding of the subject matter by its application of the discipline of the bottom line, another variant of utility.

At this point, the issue collapses into the tired argument about how loosely to fund and monitor R & D programs.

At the risk of being facile, I would sum up that the utility of cybernetics or any subset thereof would be of some interest to anyone not yet with sufficient means to satisfy his or her needs, and less so to those with a comfortable gig; more so to those wishing to liberate us all with the miracle of the FUTURE, less so to those willing to let the rest of the world go to hell in their own handbaskets.

To Know and Not to Act
Is
Not to Know

By Kathleen Forsythe and Candace Wedder (Snowflake Communications Ltd., 1030 Richmond Ave., Victoria, British Columbia, CANADA V8S 3Z5).

The recent letters on cybernetics and utility prompted us to write. As Ernst von Glasersfeld has said, cybernetics is a way of thinking. For us, it is a way of understanding what it means to live in the world.

For the last 18 months, we have been involved in establishing Snowflake Communications Ltd. as a firm of Knowledge Architects. We are involved on a daily basis in design work for learning and communications systems that involves cybernetic thinking and understanding.

Just as architects design spatial structures to come to life with the interactions of the people within them, we design communication "space" so that telecommunications networks come to life with the interactions of the people who use them. Our work involves understanding the way in which people in organizations interact with each other. In Maturana's terms, our work is an act of love when we generate a potential space for the existence of another.

This way of thinking and working is not discrete and discontinuous, to be turned off at the office door. It is a way of living in the world, a way of recognizing that spirituality is among us, in the nature and quality of the harmony of our interactions. To know and not to act is not to know.

Utility implies purpose. Maturana clearly poses the cybernetic paradox—are we both drifting and steering beings? Purpose and utility relate to the phenomenon of control and how it is we see ourselves in relation to each other from our conceptual metadomain of the observer. The issue is not an "either/or" one, but a "this and that" one. Cybernetics, in its social sense, is a way of understanding the balancing action generated from the mutual interactions of distinct entities within their ontological drift. It is the art and the science of understanding—understanding that only in the perception of difference can coherence and unity be continually constructed.

This is the connected way of knowing—the flowing, balancing, timeless activity that we, as women, find emotionally fulfilling, intellectually challenging, scientifically rigorous, and artistically and aesthetically evocative.

Cybernetics:
Is Usefulness Important?
Yes!
Does "Understanding" Convey Its
Meaning Better than "Control"?
No!

By Mary A. Powers (1138 Whitfield Rd., Northbrook, IL 60062).

I think the question of the usefulness of cybernetics may be resolved by appealing to Bill Powers' theory of hierarchical control systems. (For those not familiar with this scheme, each level constructs its perceptions from inputs from the levels below, and receives its reference signals from the outputs of the levels above, with the differences (errors) between perceptions and reference signals driving its own outputs. Only the first level receives external information and has an effect on what perceptions tell us is the external world.) For some, cybernetics is, in this scheme, a systems concept—if not *the* systems concept—which informs the principles by which they live, which in turn generate strategies, which... eleven levels down produce actions by which that high-level concept is nourished, expanded, maintained, protected, or whatever.

Others may see cybernetics as a collection of principles by which some other system concept is maintained. Stafford Beer wants to be a successful management consultant (and a poet, and someone who eats regularly and has a roof over his head), and to these ends he uses cybernetic concepts. This is not at all to say that Stafford's cybernetics are lower"—they are in a different position in the hierarchy, at least when he is on a job, and they are the means by which he does that job.

The position of a concept like cybernetics depends on how it is defined: at one time it may seem to be the reason one does anything, and at another time the means by which some other purpose is achieved. A lot depends on what the circumstances of the moment are; I doubt if anyone thinks very cybernetically when running for one's life (although that particular activity is very cybernetic in nature, having to do with maintaining one's integrity as an organism).

Ranulph Glanville objects to positioning cybernetics in the hierarchy so that it is a mere tool in the service of utility. I guess he doesn't think much of usefulness as a reason for doing what one does, for living one's life. Lots of people, however, lead very fine lives by judging what they do in terms of utility, and by trying to maximize their usefulness in the world. Cybernetics can be seen as a means of enhancing one's usefulness (as Paul Schroeder suggests it may be used to improve a reference interview—for non-librarians, what a patron asks for initially is almost never what he or she wants, with the possible exception of the location of the nearest toilet) or as a concept which can be used to generate ideas about what actually is or isn't useful.

As living systems, we are what we are as a consequence of two billion years of evolution. Utility is the name of that game. Cybernetics will vanish as surely as the eyes of cave fish if it has no utility, no explanatory power, no point of view, no suggestions for changing things that aren't better than what we have now. It will be just another little blip in the intellectual life of mankind.

Speaking of little blips, do I detect a move to get rid of "control" as part of the definition of cybernetics? Stafford Beer is up front about his reasons for avoiding the word, but he also makes it clear that he knows what he is (not) talking about. Maturana, however, wants to change "control" to "understanding." After a quite nice description of how a skipper controls a ship, he says it's not control at all, but rather "what the skipper does is to make his or her understanding part of the domain of interactions of the ship..."

I have a problem with this because I do not see how understanding can have any effect on anything or anyone except the understander, unless there is some output or action. Given that an action does occur, I agree with Maturana that it, itself, is not control. That's what control theory says, too. Any action one takes is affected by the environment as it occurs, and there is no way to accurately anticipate the vagaries of (in this case) wind and current and the mass of the ship and its momentum and so on and so forth. What a control system does control is perception, relative to a desired perception. The skipper puts forth his or her effort at the helm and continuously adjusts it in relation to the aiding and hindering forces in the water and the air, with the result that the perceived position of the ship matches the skipper's intended position. As he or she gets better at it, learns to read the currents (a perception), develops a feel for the ship (another perception), and a lighter touch on the helm (yes, another), the amount of error between perceived and intended perceptions grows smaller. This is

what expanding the domain of experiences is for in the training of the skipper. The outcome of such training, what it feels like to do it well (by which I mean the perception of doing it well), is understanding. But the process of acting, interacting, adjusting one's actions—that is control. Something Maturana left out of his discussion is that the skipper (usually) has some place to go, and it is the skipper's intention that determines the course of the ship. I do not think "understanding," as an art or a science, should replace "control" in the vocabulary of cybernetics.

Fred Steier also would do away with the word, if I understand him, because "most people" don't understand what it means in cybernetics, and because their misconceptions of control lead to misconceptions of cybernetics. I'm inclined to think that most of the people I know who misinterpret what I mean by control and find the concept obnoxious are people I've met in cybernetics. Most of the other people I know can easily appreciate positive definitions of control, even if their initial thoughts are of manipulation and domination. Almost none of them have the faintest idea what cybernetics is, so their concepts of control don't contaminate it. Cybernetics is in much more trouble from cyborgs, cyberpunk, and so on, and I don't think that calling it the art and science of reflexive understanding is going to help a whole lot.

The problem with such a definition is that it is so broad. Everybody, from infant to adult, dullard to genius, has an understanding of some kind, rudimentary or sophisticated, more or less artistic or scientific, depending on capacity, experience, and inclination. There is cybernetic understanding, and there is also Islamic fundamentalist understanding, and the understanding of gang members in Los Angeles, and that of elementary school children in Illinois. Cyberneticists seem to share an understanding that they feel is better than other kinds—more humane, more aesthetic, more (fill in the blanks). My question is: where does such understanding come from that makes cybernetics different from any other world view the human race has come up with over the last ten or twenty thousand years? Many of you are going to hate this answer: it comes from control theory. Control theory is a system concept which can generate principles, values, and ideas about human organization and relationships—ideas which coincide, not coincidentally, with what cyberneticists believe. Not coincidentally, because what started cybernetics in the first place was the idea of applying the principles of control theory to living systems. Those who prefer to apprehend cybernetic ideas intuitively are certainly free to do so—people have had such ideas long before cybernetics and will continue to have them, whatever labels they use. But if they dismiss control theory because of some mistaken notions about what control means, they are throwing away the one thing that makes cybernetics unique: a quantitative, testable theory that can account for, explain, and justify not only their science, but also the basis of their art. (Don't get me wrong—I said the basis, not the art itself.)

And Fred, the point of Bill Powers' experiments is not "controlling a joystick." The joystick is *not* what is being controlled: it is moved in order to control the perception of a cursor relative to other cursors on a screen. How this is done by various people with various hidden and random disturbances affecting the joystick and the controlled and uncontrolled cursors is intended to provide data for analyzing the characteristics of human control systems. Until and unless this sort of basic research is done, cybernetics is not a science, but simply a matter of opinion, and not really worth taking seriously as an alternative to prevailing theories.

The Interfacing of Systems

By Kenneth Silvestri (39 North Fullerton Ave., Montclair, NJ 07042). Copyright 1988 by Kenneth Silvestri.

I have some reactions and thoughts regarding three pieces in CC #12: *"Should* Cybernetics Be Useful?" by Ernst von Glasersfeld, "Psychology and Ecology..." by Jurgen Hargens, and "The Notions of Cybernetics" by Humberto Maturana.

The theme of living systems being considered "informationally closed" is confusing to me. I accept the notion that the human nervous system reacts based on its structure, as discussed by Maturana. I also have little difficulty understanding a similar view presented by Francisco Varela (1988) when he describes the multitude of ways in which components of a structure interact with perturbations. My uneasiness is with the interfacing of systems. Even though our world views are mental constructs, as Bateson demonstrated, we are in relationship with external systems—even if they are "mental" distinctions.

Bateson referred to the importance of "context" as being where evolution takes place. I believe he was talking about relationships. He spoke of "love" as being the commitment and respect for the ecological process, including something like "learning" as an interconnected pattern of human organization. "Wisdom" to him was the understanding of how these patterns of organization are connected and simultaneously part of wider levels of organization (see Bateson, 1977). In a similar way, Marilyn Ferguson (1980) refers to how Ilya Prigogine describes "dissipative structures" as open systems that are maintained by ongoing consumption of energy. It is through fluctuations that parts of a system are allowed to reorganize into new wholes or higher orders.

Is it not here, with these connections, that we as "perceived" autonomous beings could mitigate the injuries of life? Could we deal with something being perceived as noninjurious in one context (i.e., DDT protecting crops) and it being simultaneously injurious in a wider context (DDT contaminating life) if each of us is a closed system? Hargens concludes that we "must be concerned about whether our surroundings are respected and protected by other persons." It seems to me that recursiveness is sharing information in a relationship context and evolving in relation to differing systems. Family therapists, for instance, will introduce information into a family system and help with the consequences. The consequences are indicative of the prior make-up; however, the evolving awareness/perceptions are produced by reframing, based on new information found in the family dynamics.

I believe that I am talking about the same process that is discussed by von Glasersfeld, Hargens, and Maturana, however it is with regard to the notion of "closed systems" that I would appreciate responses. I also believe that Maturana's change of the meaning of cybernetics to "the science and art of understanding" will help in a more collaborative process toward understanding our sense of organizations and consequent relationships.

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Responsible Cybernetics for Humane Progress

By Gary Boyd (Education H549, Concordia University, 1455 DeMaisonneuve Blvd. West, Montreal, Quebec, CANADA H3G 1M8). Copyright 1988 by Gary Boyd.

This is in reply to Humberto Maturana's "The Notions of Cybernetics" (CC #12), and in response to Larry Richards' call for comments.

Professor Maturana states that he would like to change the meaning of the word "cybernetics" so that it would mean the "science and art of understanding." That is a queer and loaded proposal. The queer thing about the "modest proposal" is that it *substitutes* the *verb* "to understand" for its cybernetic *object: communication and control.*

As a science, of course cybernetics has to do with understanding, but the phenomena which it seeks to understand, and which make it a distinct science, are precisely the phenomena of communication and control. To drop the latter simply leaves one with "Natural Philosophy"!

Communication and control are what we cyberneticists seek to understand and create. Our great triumphs have been in showing that feedback and mutually-causal mechanisms can produce and account for a lot of *(but not all)* apparently purposive and apparently self-organizing behavior—and this entirely within the realm of physical necessity and chance.

The two great questions which remain for the science of cybernetics, in my view, are:

1. Can we learn to design and conduct people-machine conversations which *certainly* make possible the *propagation of symbiotically viable* cultural meme-complex forms? (And in particular those where the ultimate values are wise-love and wise-beauty.)

2. Can we model biophysical causal processes well enough to show exactly where it is possible for some non-chance and non-necessity processes to be inherent in human "free will" and "creative inspiration"? (We have shown where "spirit" is *not* needed; can we show where it is *essential—if* anywhere?)

There is much else that could be said about Maturana's proposal. There is an odd connection with Kant's strange notion of the *practical*, one which occurs again in Habermas *contra* Luhmann. The everyday discomfort we feel due to the oppressive connotations of the word "control" certainly is not a good enough reason for banishing it.

We need qualitative and quantitative control models which are heuristic, prescriptive, and even predictive, if we are to have a true science of cybernetics capable of nourishing real human progress—progress which is terribly urgent in a world of going-on six billion people, with one billion starving.

A Letter

From James E. Brassert (Postfach 1265, D-7400 Tubingen 1, GERMAN FEDERAL REPUBLIC). Copyright 1988 by James E. Brassert.

> Since I first heard the term over twenty years ago, I have been trying to grasp the meanings of the word cybernetics.
> P. Schroeder, *CC* #12

No one to my knowledge has ever challenged the priority of Norbert Wiener to define the science of cybernetics. He called it: "The science of control and communication in the animal and machine. "It has always seemed to me that he was making two very strong points within this definition...

> First: regulation is dependent upon the flow of information and also (as Conant and Ashby later showed rigorously) on the adequacy of the model the regulator incorporates of the processes to be regulated. Second: there are invariances that govern such regulation within any complex system...
> S. Beer, *CC* #12

This raises the question whether I am in the clear in presuming that if there is a science of control and communication there is also a science of *regulation* and a *model* incorporating a *regulator* which *must be able to be distinguished* from the process to be regulated, and the model *must be able to be tested in use.*

> ... I proposed a new definition of cybernetics as "the science of effective organization." I did my intellectual duty: I took this definition, and my reasoning, to Norbert Wiener. He... gave me his blessing
> What is a science? The Latin root is clear enough: a science is a knowing. I like the definition: ordered knowledge. It has to do with understanding, with insight. A science, as such, has no utility—except to the enlightenment of the scientist—s/he who has the knowledge... the utilitarian purpose can be ascribed only to the knower of the science, and not to the science itself which has no such teleology.
> S. Beer, *CC* #12

> Definition should, as the expression itself shows, properly mean only so much as the display or (re)presentation of a concept in an originary and sufficiently thoroughgoing manner. (1) According to a demand of this sort, an empirical concept cannot be *defined* at all, but only *explicated.* For it gives us only certain features of a certain kind of sense objects and, this being so, we can never be sure whether *under* the word that designates the same object, we mean to subsume at one time a greater, at another a lesser number of characteristic features. (2)
> I. Kant, *Critique of Pure Reason,* A 727

> Rather than use the expression definition, I would prefer *exposition...*
> I. Kant, *Critique of Pure Reason,* A 729

Kant goes on to indicate that we ought to *distinguish* between the practice of *preceding* our work with definitions (as in *mathematical* usage) and *concluding* it with them (as takes place with *philosophical* definitions).

Once again I feel thankful for Kant. Since I first studied him, remarks of his such as the above have, whether I felt myself in thoroughgoing agreement with him or not, provided the starting point or point of return for a number of conversations with myself, or paths of reflection relating not only to what he *actually said,* or to the denial thereof, but to *possibilities* that might first be disclosed when taking into account a relationship between an actualized past and a possible future. Provided that such a relationship could be conceived or envisaged, such paths of reflection might disclose to us "reflexive loops" of relations between concepts and connections of concepts, on the one side, and sense impressions and connections of useful action and, not least of all, between concepts and formulations on the one side and their use as (in)formative of sense impression and action on the other.

In the further course of his remarks on "definition," Kant indicates that he is also satisfied with the word "clarification," which may be more amenable to translation into English, and may be more germane than "exposition" to a conversation in which ideas, also affect-laden ideas such as have been traditionally associated with those of "freedom" and "enlighten-

ment," may, with certain reservations, lay fair claim on our attention.

In bringing certain "lawlike formulations" or "invariants" to the foreground of our attention, modern science has perhaps done nothing which the religions out of which it emerged did not do before. Both modern science and the more ancient religions have done this, and in so doing, relegated changeful-ness to the background of our consciousness—a changefulness against the background of which, nonetheless, the attention to invariants first could become meaningful and useful. The claims of science, as also the Kantian critique of knowledge, relate to the scope and depth of content and reliability of the invariants thus exhibited, more than to their presence among us. But what happens where we become concerned with more differentiated *relationships of "invariance" and "changefulness" to one another?* For example, with the *relation to one another* of sciences having as their objects "material forms" and sciences having as their objects living beings. What happens to the proposal that such "invariants" be seen and conceived as governing or regulating not only our knowledge not only of relatively abstract material forms, but also our knowledge of *themselves,* the invariants, and thus our knowledge of our knowledge *and* our knowledge of our "situated knowledges" or of "other (subject-)objects" which may be outside our knowledges, yet be, imperfectly, but with some degree of testable worth or usefulness, *divined* by them?

I think such a formulation as "knowledge of our knowledge itself and of that which is other than itself" flitted into recent issues of *CC.*

> ... a group of us... felt that a definition that might fit better might allow us to recognize that cyberneticians were concerned with processes of organization (including the observer's), and their inherent circularities.
>
> As I recall this recent past, I realize that my concern for an evolving definition has been due to several factors. One of these has been an attempt to understand what cyberneticians (myself included) do, and how we see, an attempt made more serious by the recognition that cybernetics (particularly since the articulation of a second-order cybernetics) has allowed us to become our own anthropologists, by always turning our ideas back onto ourselves through core relationships of circularity and reflexivity.
>
> F. Steier, *CC* #12

Would that mean back onto an idea we have of what it might mean to be a human being?

> ... cybernetics might best be thought of, not as a discipline, but as a *way of seeing.*
>
> F. Steier, *CC* #12

Could that mean a way of seeingly conceiving or conceptually seeing that relates our ideas and formulations back onto themselves through trials imposed by the manner in which, *conducting ourselves by reference to them,* we also use them?

An eye for transformable forms, for those which are flitting, for those capable of more enduring metamorphoses, for the *schwankende Gestalten* of Goethe—has *that* to do with the core relationships of cybernetics?

According to "K" Staats, in *CC* #12, science (knowledge) and art have something, *some similarities* in common. If we agree on this, can we agree that there can be *more and less severe demands on the conditions of our knowledge,* having relation to the determinedness or undeterminedness of its objects? And can we agree that there *must* be able to be these more and less severe demands, and that there *must* be able to be relationships of these kinds of demands to one another, not only *de facto,*

but also *de jure?* A *de jure* status not only of capacities to be determined, but of capacities to determine and co-determine in the first place, and to determine and co-determine anew? Capacities not only of being constituted, but of constitution and reconstitution?

But there may be good, or—what may be sufficient—at least tolerable reasons for disagreeing, if with the tolerance which emerged following the religious wars of the seventeenth century, we made a concession to a sense of reality.

> ... each cybernetician has his or her own way of defining the field... nevertheless, there is a certain amount of consensus about a number of topics that are considered to be part of it.
>
> E. von Glasersfeld, *CC* #12

The care that there be that kind of *society* which is tolerant of *individuals,* and of their defenses of their individualities, and of their individual ways of seeing and conceiving the same ideas as fruitful for themselves and the society, seems to me of highest relevance.

Notes

1. The expression "sufficiently thoroughgoing" has reference to the distinctions made in the process of (re)presentation and to their precision. See Kant's note in the same place.

2. "Under." To *"subsume under* a word" means for Kant as much as "to include in the sphere of that word's use. Kant's *distinction* may be useful even if, and precisely when, we reserve judgment as to the matching of sides of the distinction with the kinds of entities defined.

EXPEDITION *S*ynergistic *E*co-holarchical *M*etamorphic *E*mergence of *N*oosphere

By Laurence J. Victor (Pima Community College, P.O. Box 5027, Tucson, AZ 85703). Copyright 1988 by Laurence J. Victor.

This is submitted in response to Larry Richards' request for comments on the implications of Humberto Maturana's article in *CC* #12.

I am just now finding the theoretical work of Maturana and Varela supporting my course of action beginning a decade ago. After spending several years in various social reform movements, I read Donald Michael's *On Learning to Plan and Planning to* Learn and concluded from it that the reform of large, complex, dysfunctional societal systems (such as universities and nations) was impossible. I also believed (based on global simulation studies) that continued growth—business as usual—without radical and significant change in structure/process destined us for societal collapse and possible oblivion. Revolution being futile, I found my solution (in 1976) in the design of a process I call "societal metamorphosis," in close analogy to how a butterfly emerges from the dissociated components of the caterpillar. The caterpillar doesn't transform itself into a butterfly; nor will contemporary institutions transform themselves (or be transformed) to the successful sustainable societal structure/process eco-holarchies of the future.

Trans-form-ation starts with an "initial" form, and through successive modifications of form, results in a new or "final" form. Emergence, as an alternative to transformation,

considers new forms manifesting from a substrate (where previous forms are/were existing) through autopoietic self-organizing processes. Contemporary NewAge fascination with "transformation" as the "highest" type of change is a dangerous bias.

Strictly speaking, Maturana's theory doesn't address the origins of a new autopoietic system, but only the changes that conserve its identity. I propose the design and manifest creation of new seeds which will "become alive" and develop with autopoietic autonomy. This is possible when alternative sociocultural systems are first "simulated" as ecologies of ideas within the mind/brains of individuals, and later made manifest. One such world already exists in material form within my mind /brain; it now needs to exist also in material form in the mind/ brains of others, and in the social dance.

I also propose a "second order" autopoiesis, where a ("first order") autopoietic system can "quantum transist" into another ("first order") autopoietic system with a different, but related identity. Thus, the breakdown of an autopoietic system is not necessarily "disintegration." Thus, we can alternatively view the development of a metacellular organism as one continuous autopoietic drift, or as an evolutionary process with sudden "quantum reorganizations" which "break" with the original autopoiesis. It is through this process (learning as evolution) that we transcend "material-linear mechanism/ rationalism."

From this start, I began the process of designing a PHD program for bootstrap self-education, the Program for Human Development, its cornerstone being Learners for Quality Education (LQE). Since then, I have added to the biological model of insect metamorphosis (now applied to psychological as well as social systems) the additional models of cellular autopoiesis, reproduction, and metacellular embryonic development, in a trinity of complementarity.

One metaphor for society is a dance: temporal patterns of human interactivity. Individuals get up in the morning and go through their daily processes. Collectively, through social coupling, this results in the construction of societal artifacts, which constrain and enable further dance. The dance of civilization is primarily mechanical and based on attempted hierarchical control, which denies the process of social evolution. Components of machines cannot evolve, and they usually cannot develop; they remain within a narrow range of variation, or begin to decay. A social world (in mind and matter) that is (and is believed to be) only a complex machine can only treat its components as machines, also.

The contemporary dance re Gaia is closely analogous to malignant cancer. Technological engineering design processes today produce negative synergy, and cannot dissolve/resolve the World Problematique. We need to design/perform (in cycles of autopoietic autonomy that generate positive synergy) a new dance in our discretionary time. The new dance will spread upward from teams to communities to societal networks, and outward to subcultures, cultures, and peoples. It will not be choreographed as a final structure/process; instead, generative processes will be explored. Much of the new dance will occur in a new synergy of synchronous/asynchronous interactivity facilitated by computerized telecommunications technology—as nuamphibians within Expeditions in Time, we explore the domains of symbolic reality. As a newly fertilized cell emergently creates a baby, so new "community expeditions" create the new dance, attracting persons to give more and more time from the old dance to the new dance, until we can begin to give up the old dance altogether.

In "practical" practice, the comprehension of LQE requires a figure/ground reversal re education and learning. From a traditional systems perspective, education cannot achieve quality so long as the learner is viewed as part of the environment, to be treated or served by the system, and not as a functioning component of the system itself. Learning/education is inherently autopoietic. The labor intensivity of evolutionary education requires the full participation of both student and teacher turned learner/educator, in a mutually interactive, autopoietic emergence. The effect of this on Gaia I liken to a synergistic eruption of positive magnitude equal to the negative magnitude of Nuclear Winter.

The primary learning materials and processes are designed concurrently with studying/teaching, and they are designed by/for LQE members. There is no sense of trying to teach something to someone. Each LQE member has certain expertise (cognitive competencies) and interacts with others as components of an eco-holarchy which mutually facilitates the learning of each person and the learning of higher level holons (teams, communities, etc.). (I use the term eco-holarchical to label the complementarity between systems and network thinking at higher levels of organization beyond systems or webs.)

A basic process/component of LQE is the Learning Expedition, which is a synergistic combination of educational courses and curricula, R D projects, and businesses. Learning Expeditions themselves can be viewed as living beings, with membranes called PRSOS. These membranes facilitate the Promotion, Recruitment, Selection, Orientation, and Support given to new persons joining the Learning Expedition. Only in the "outreach" aspect of PRSOS does LQE attempt to teach anything to anyone.

Over the years, I have found these ideas very difficult to communicate. I realize that I need Learning Expeditions to accomplish it, and that I must go beyond communication. This short essay cannot convey what I want to convey—but it may trigger some interest from which we continue the conversation. I invite you to join with me in expedition, where we will, by autopoietic bootstraps, create our LQE system to optimally facilitate our "learning what it takes to learn and what we need to learn, and then learning it." That is, I invite you to explore with me these proposals; learn more about them and contribute to our growing knowledge of them.

If "all doing is knowing and all knowing is doing," then by learning to know better, we will be doing better. From the old paradigm of thinking leading to acting, it is difficult to favor a view that says to start shifting energies toward more thinking (and more learning to think), away from frenetic reactivity and attempting to fix things on the basis of our existing distributions of knowledge and competencies. Our dangerously dysfunctional world is so because our knowing system is inadequate. We mistakenly believe that simply providing the tools for learning, such as new computer and communications technology, we will learn. The water has risen to nearly cover the thirsting horse, and still he won't drink. We so grossly under-employ our learning tools today that it can be viewed as seriously pathological. We are turning in the womb, refusing to be born. It would be o.k., we could turn around a few more cycles of civilizations, if we had time. But we don't.

Our best contemporary efforts to face this "crisis of crises" are insufficient, primarily because we avoid embracing complexity and resist precision-of-fit for coordination of our learning/doing. In particular, we trivialize the magnitude and extent of learning *we* (the humanist change agents) require—learning in domains where we are high-risk learners. In our expedition, we will attend explicitly to the growth/development/evolution of the whole system which is necessary and sufficient to do this.

"The knowledge of knowledge," as the informational seed in semen, "compels" the fertilization of the NewAge (the receptive sociocultural movement, analogous to the cytoplasm/nucleus system of the egg), resulting in self-organization as noosphere (as the cell creates the baby). The name for this whole has evolved concurrently; presently it is "Expedition SEMEN." Please contact me directly for more details.

"Should Cybernetics Be Useful?" A Conversation among Non-Cyberneticians

By Samuel B. Bassett (34 Oakland Ave., San Anselmo, CA 94960), Bob Bickford, Gareth Branwyn (The Gesundheit Institute, 2630 Robert Walker Place, Arlington, VA 22207), William Calvin (Biology Department, NJ-15, University of Washington, Seattle, WA 98195), Mitsuhara Hadeishi (25800 Ind. Blvd. W. 2271, Hayward, CA 94545), Dan Levy, Mandel (SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025), Jack Powers, Howard Rheingold (306 Poplar, Mill Valley, CA 94941), Hank Roberts, and Maria A. Syndicus (SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025). Copyright 1988 by Samuel B. Bassett, Bob Bickford, Gareth Branwyn, William Calvin, Mitsuhara Hadeishi, Dan Levy, Mandel, Jack Powers, Howard Rheingold, Hank Roberts, and Maria A. Syndicus.

[Editor's Note: This is a transcript of a conversation on the WELL (Whole Earth 'Lectronic Link), a computer bulletin board associated with the *Whole Earth Review*. It is my understanding that none of the participants are professional cyberneticians. Here is an opportunity for ASC members "to see ourselves as others see us." If you have access to a computer and a modem and would like to try the WELL yourself, call 415-332-6106 for online sign-up, or 415-332-4335 to talk with a human about it.]

Topic 221: Should Cybernetics Be Useful?
By: Gareth Branwyn (gareth)   Wed, Feb 3, '88

A friend of mine Greg Williams edits a newsletter on cybernetics with a special focus on Gregory Bateson called *Continuing the Conversation* (Rt. 1 Box 302, Gravel Switch, KY 41328 $13/4 issues). The upcoming issue is on the neglected and often controversial subject: The Utility of Cybernetics. Should cybernetic ideas be applied (Pop Cybernetics?) or should cybernetics remain a research paradigm? If aspects of cybernetics have practical aims, how should those aims he identified and how can we keep theoretical/research aspects separate from applied aspects? Or should we bother? Does it have to be useful to be interesting?

I would like to get some Mind Conferees' opinions on this and then submit them to Greg. I will e-mail everyone for permission before sending. The deadline is March 1.

24 responses total.

Topic 221: Should Cybernetics Be Useful?
1: Howard Rheingold (hlr)   Wed, Feb 3, '88 (18:41)   6 lines

Elin Smith, who hasn't been around the Well in a few months, is involved in cybernetic education at San Jose State. I asked her what the heck cybernetic education means, and she said that one thing she does is to give her final exam on the first day of classes, then she and the class spend the rest of the quarter trying to work their way to that goal.

Topic 221: Should Cybernetics Be Useful?
2: Jetboy (Handel)   Thu, Feb 4, '88 (12:2?)   4 lines

I don't understand the assertion that cybernetics is a research paradigm. It is a well established and thoroughly acceptable element of virtually all areas of systems analysis (hard and soft), at the very least.

Topic 221: Should Cybernetics Be Useful?
3: Maria A. Syndicus (nano)   Thu, Feb 4, '88 (12:31)   4 lines

I have been using a similar method at work. On a project, I prepare the final presentation first, before I sit down and do the research. It helps me stay focused and forces we to look at the real questions. Most importantly, I learn how to anticipate—and ponder—questions that clients will ask.

Topic 221: Should Cybernetics Be Useful?
4: Dan Levity (danlevy)   Thu, Feb 4, '88 (14:21)   3 lines

And if you can get away with it, you don't even have to bother with the research part or it.

Topic 221: Should Cybernetics Be Useful?
5: Jetboy (Mandel)   Thu, Feb 4, '88 (17:29)   2 lines

Er, Nana, I think you just undermined my chance of selling a huge project to Dan Levity....

Topic 221: Should Cybernetics Be Useful?
6: Gareth Branwyn (gareth)   Thu, Feb 4, '88 (21:20)   7 lines

OK, I should have worded my question differently. Of course cybernetic ideas have penetrated many sciences (soft and hard) and even mainstream culture to some degree—but—the question is: Is this a good thing? How has cybernetics been useful? How has it been corrupted? What are the practical applications? Should there be distinctions like 'Pure' Cybernetics, Applied Cybernetics? Or should it be ambiguous like it is now?

Topic 221: Should Cybernetics Be Useful?
7: Jack Powers (jackp)   Thu, Feb 4, '88 (23:43)   3 lines

How could knowledge not be a Good Thing? Why single out any one field? Haven't the atomic energy people been over the rack on this tangent for years?

Topic 221: Should Cybernetics Be Useful?
8: Jetboy (Mandel)   Fri, Feb 5, '88 (13:31)   3 lines

Of course it's a good thing to know how things actually work. Cybernetics, i.e., feedback theory, is at the core of virtually all living and many other kinds of systems.

Topic 221: Should Cybernetics Be Useful?
9: Bob Bickford (rab)   Fri, Feb 5, '88 (23:39)   4 lines

Since when is 'cybernetics' the same thing as feedback theory? This is news to me......

Topic 221: Should Cybernetics Be Useful?
10: Mitsuharu Hadeishi (mitsu)   Sat, Feb 6, '88 (81:08)   9 lines

Cybernetics, as in Gregory Bateson's work, could be considered to be feedback theory. What it amounts to is a systematic study of the interrelationships within a system with particular emphasis on circular circuits of relation. Bateson has written a couple popular books on the subject, in particular _Mind and Nature_ comes to mind (comes to Mind?). That's the best place to go for a thorough exposition on the subject.

-Mitsu

Topic 221: Should Cybernetics Be Useful?
11: Jetboy (Handel)   Sat, Feb 6, '88 (15:02)   2 lines

Cybernetics, in Norbert Wiener's classical formulation, is effectively the same thing as feedback theory. Or control theory, if you wish.

Topic 221: Should Cybernetics Be Useful?
12: Howard Rheingold (hlr)   Sat, Feb 6, '88 (16:38)   5 lines

Except Wiener, Rosenblueth, et al., in their original formulation, explicitly generalized control/feedback theory ("cybernetic" comes from the Greek roots meaning 'steersman') to include electrical circuitry, biological organisms, information processing machines, and larger systems such as ecosystems.

Topic 221: Should Cybernetics Be Useful?
13: Jetboy (Handel)   Sun, Feb 7, '88 (11:52)   2 lines

Right. That's what I mean, Cybernetics is everywhere. What amazes me is that everyone hasn't caught on yet.

Topic 221: Should Cybernetics Be Useful?
14: Mitsuharu Hadeishi (mitsu)   Sun, Feb 7, '88 (20:21)   76 lines

I think one of the difficulties here is that cybernetics is often presented as only a conceptual framework rather than a set of precise principles. It cannot be argued that the framework is valuable, perhaps even essential to the understanding of feedback systems, but how does cybernetic analysis fundamentally differ from more traditional methods of analysis? Does it offer anything different or new?

Perhaps the most fundamental insight of the cyberneticists is that MOST systems are feedback systems. That is, everything from a thermostat to a human being, a steam engine to an ecosystem. Of course, not everything is a feedback system; again, Bateson lists the qualities that a system must have for him to call it a feedback system—and he calls such systems "mental systems," I.e. for Bateson, the definition of Mind is stated in terms of feedback theory.

The next fundamental insight is that mental systems May interact, and the sum total of their interaction is a larger mental system. Thus the concept of the interrelatedness and interconnectedness of all systems is implicit. A cybernetic medical professional, therefore, would take into account the person's (no, family situation, stress situation, workplace environment, sleeping habits, psychological state, and so on. A traditional medical professional, on the other hand, tends to deal with the patient's affliction in isolation from any other relevant factors. Most of you probably saw _My Dinner With Andre_ in which Andre recounts his horror when, after the doctor treating his mother says she's about to die, an arm specialist comes by and remarks on how wonderful it is that his mother was doing so well.

What is missing, therefore, from traditional analytic approaches, is just the bare recognition of the fundamental importance of systemic influences. The approach of specialization runs totally counter to the need for systemic understanding. For example, although someone may become an arm specialist, they should be required to take courses in cybernetics, what might be called "medical cybernetics", i.e., what is usually called holistic medicine. Today, although an doctors practice informal therapy of this kind (i.e., 'bedside manner) it is NOT taught or even recognized in medical school. For example, even the incredibly important topic of nutrition is virtually ignored in the medical curriculum! This is simply an example of the utter lack of understanding of systems theory in modern medical practice.

So it seems it is not so much a question of whether cybernetics is useful, but why it hasn't been accepted as a methodology in most modern scientific fields. It is clear that in case after case one can see with embarrassing clarity the terrible impact of the lack of systems thinking in most scientific fields' when there is systems thinking, it tends to be terribly informal and haphazard-there is no general awareness of the principles of systems theory.

Now, however, here is a question: what exactly ARE the principles of systems theory, and can general results be obtained from them with immediate non-trivial application in other realms of science? That is to say, for example, there are general results in logic which tend to be applied in many realms of science; can the same be said of cybernetics? Another way of putting this is: is cybernetics more than "just" a set of guidelines about thinking about systems?

Even if it were 'just" a set of guidelines it would be an immense improvement over the current set of informal guidelines in any scientific fields. As mentioned above, the specialization approach basically destroys systemic understanding called "wisdom' in other cultures) and leads to all sorts of pathological effects. Simply acknowledging the importance of systemic effects can radically change the style of research in any given area.

I think we have to redefine our notion of 'general principles' in order to understand the nature of cybernetics. If principles are understood to rest on approximate definitions, then principles are essentially formulations of patterns of observation. The "principles' of systems theory amount to observations of shared patterns among different cybernetic systems, and as such, can be very useful in the study of new feedback systems, whether they be ecosystems, social systems, organisms, or mechanical systems.

-Mitsu

Topic 221: Should Cybernetics Be Useful?
15: Bob Bickford (rah)   Non, Feb 8, '88 (01:13)   18 lines

(nearly) All systems are feedback systems.

This seems so glaringly obvious that I quite honestly have trouble believing that anybody can be doing science today and not know this. True, one may not think of it on an immediate and daily basis, and that perhaps is a problem that needs addressing. But to say or imply that there is any doubt of the truth of the proposition seems quite strange to me, at least.

I remain surprised that this is the definition of "cybernetics", since prior to this my exposure to the word had given me a pretty solid impression that the meaning was more or less 'smart robotics'. My dictionary defines it as "the study of human control functions and of... systems designed to replace them", with no alternate definitions given. (This is not meant as an argument with your definition or usage but merely as an observation on a possible point of confusion.)

Topic 221: Should Cybernetics Be Useful?
16: Jack Powers (jackp)   Mon, Feb 8, '88 (15:14)   4 lines

Wiener's book "The Human Use Of Human
Beings" contains a layperson's intro
to cybernetics (along with, as you might
guess, other stuff).

Topic 221: Should Cybernetics Be Useful?
17: Gareth Branwyn (gareth)   Tue, Feb 9, '88 (20:43)   22 lines

Mitsu touches on the sort of stuff I was after with this topic. Especially:

1) The confusion over whether cybernetics is a conceptual framework or a set of precise principles. While this doesn't seem to be a problem with respondents to this discussion, it is something that is argued in the cybernetic community.

2) "... can general results he obtained from [the application of cybernetic principles] with immediate (non-trivial) application in other realms of science?" And, its (non-trivial) application in social, political, cultural, and spiritual systems, management science (Stafford Beer) and human-potential training (Fernando Flores).

3) "... the specialization approach basically destroys systemic understanding (often called "wisdom' in other cultures) and leads to all sorts of pathological effects," YES!!, but trivialization (called "hype" in our culture) can also lead to pathology.

4) "... the principles of systems theory [cybernetics?] amount to observations of shared patterns among different cybernetic systems..." Here is where you enter the realm of aesthetics and are worlds away from the mathematical models you started with.

Topic 221: Should Cybernetics Be Useful?
18: Samuel B. Bassett (samlb)   Sun, Feb 14, '88 (00:34)   21 lines

Given that I am a non-Batesonian (I haven't been able to read much of his stuff for one reason and another). I wind up as tar in the dark as RAB in trying to follow this discussion.
I have read some of Wiener's writing on Cybernetics, and agree with the comment that it is essentially equivalent to "feedback theory". It is, as I understand it, the study of self-regulating systems, and how they manage to be that way.
I am not aware, from my reading, of much (if any) use of the word "Cybernetics" since Wiener himself passed away. In the computer industry, they tend to talk about "the theory of automata' when discussing robotics, or just say "robotics'.
From reading the discussions here, it seems that Bateson has used the word in a context where I would use the words "general overview', 'systems overview", or 'teleological analysis"—looking at a system or study from the point of view of where it is going, what its purposes are, and deliberately maintaining as broad a focus as possible—trying to grasp _all_ of the factors which influence it.
As such, I heartily endorse the _principle_, but remain a bit confused at the _terminology_

Topic 221: Should Cybernetics Be Useful?
19: William Calvin (wcalvin)   Sun, Feb 14, '88 (11:35)   4 lines

My suspicion has always been that a certain branch of New Age whatever has simply adopted cybernetics as a term, quite independent of its origins, and that its meaning is little different from holistic in their usage. Corrections?

Topic 221: Should Cybernetics Be Useful?
20: Mitsuharu Hadeishi (mitsu)   Sun, Feb 14, '88 (14:30)   4 lines

Bateson's work was highly specific and covered many case studies of specific systems ranging from biology to engineering to psychology. His insights were certainly useful and powerful and certainly could not be characterized as simply 'holistic" in the vague sense.

Topic 221: Should Cybernetics Be Useful?
21: Howard Rheingold (hlr)   Sun, Feb 14, '88 (14:31)   3 lines

There are some interesting riffs, and I believe a very good reading list, on contemporary cybernetic thinking in the info conference menu. Go info, then type info at any prompt.

Topic 221: Should Cybernetics Be Useful?
22: Hank (hank)   Mon, Feb 15, '88 (22:43)   8 lines

here are some situations I've heard described as 'cybernetic" in the past week

a family coming to counseling presenting one kid as "the patient"

aids spreading behaviors, sex and drugs

computer viruses spreading among those who share software

Topic 221: Should Cybernetics Be Useful?
23: Jetboy (mandel)   Thu, Feb 18, '88 (117:10)   16 lines

Bateson's linkage of cybernetics and mentality) constitutes a potential abuse

of the term cybernetics, or at least helps encourage its sloppy usage. Not all cybernetic systems are mental systems, although all mental systems are cybernetic systems.

The examples Hank describes are all 'cybernetic' in the sense that they involve feedback systems. But the use of the term is quite trivial, since all social systems involve high levels of extremely complex feedback loops, I think the problem with cybernetics in traditional scientific domains comes out of the tradition of trying to isolate specific phenomena to study and experiment with them. In the real world, most phenomena do not exist in isolation but are rather elements or subsystems of more complex, often cybernetic systems. I would think *any* well-trained scientist would know that today.

Topic 221; Should Cybernetics Be Useful?
24: Gareth Branwyn (gareth)   Mon, Feb 22, '88 (18:19)   41 lines

Sorry I've been away from this discussion for some time—my modem is down and it will be several weeks before I'm online again on a regular basis. Today I peer in from someone else's window on the WELL.

Good stuff is being bantered about here. Some comments:

› As Mitsu has pointed out, cybernetics, at least Batesonian cybernetics, is highly specific and not vague like such of the "holistic' movement. It is interesting to me, being part of an experimental health community (called Gesundheit Institute) and being very such immersed in the holistic movement (with reservations and a healthy sense of humor), that I can point to no book or resource that systematically attempts to outline what holism is. Bateson on the other hand worked hard at rigorously defining and clarifying what he was talking about. Since he was trying to think and talk about things (or more importantly relationship *between* things) in a new way (attempting systemic definitions for "love and "wisdom"), and since he spent so much of his time in a cross-disciplinary domain of "meta-pattern", he found it necessary (some might say he made the mistake of) coining new terms and modifying the usage of old ones. This does turn out to be one of the reason he is so often misunderstood by the casual reader. For glossaries of Bateson terminology see *Mind & Nature* (G. Bateson), *Angels Fear* (G. Bateson & M.C. Bateson), and *The Reenchantment of the World* (M. Berman).

› Bill Calvin is correct that cybernetics is a word that certain new age types find 'sexy" and they use it indiscriminately without any knowledge of what it means. Like all scientific discoveries and new paradigms of thought, the level of comprehension of the original idea and the nontriviality/triviality of its application runs along a spectrum from the origins of the discovery to the most banal, pop usage (idea as icon). This is a great problem in cybernetics since it deals with the interpretive complexities of general systems and pokes its finger into everything from mathematics to psychology to religion.

› In re: Mandel's comments about Bateson, cybernetics, and mind: If you are using Bateson's definition of mind, then it is pretty clear what constitutes mind or mental process and what doesn't (see *Mind & Nature* pg. 92 hb, 102 pb for his criteria of mind). Outside "Batesonianism" (he would bristle at an "ism" in his honor) you do get into a muddle mixing common usages of "mind", 'systems', "information", etc. in discussions of his ideas.

What Is Special about Behavioral Cybernetics?

By Geraldine Fennell (59 Rennell St., Bridgeport, CT 06604). Copyright 1988 by Geraldine Fennell.

For the task of regulating physical variables to achieve some overall objectives, the concept of cybernetics is valuable. As it has been applied to understanding human behavior, cybernetics tells us little of what we want to know. Both in physical and behavioral applications, the concept is usually applied where the domain and goal of operating/acting are known. What is interesting, and especially elusive, about naturally occurring human action is its substantive objective—what the individual is doing, in fact. To find the answer, we must look upstream from the point where a cybernetic analysis usually begins.

Using a rough plan of the context for acting (Figure 1), we may begin to move in on the task of understanding the objectives of action and, in the process, clarify some special features of behavioral regulation. I should appreciate hearing from physi-

cal/biological scientists who will contrast regulation as they know it with behavioral regulation.

An early opportunity for psychologists to learn about the "cybernetic hypothesis" was in a 1960 book where we read:

> Action is initiated by an "incongruity" between the state of the organism and the state that is being tested for, and the action persists until the incongruity (i.e., the proximal stimulus) is removed. The general pattern of reflex action, therefore, is to test the input energies against some criteria established in the organism, to respond if the result of the test is to show an incongruity, and to continue to respond until the incongruity vanishes, at which time the reflex is terminated. Thus, there is "feedback" from the result of the action to the testing phase, and we are confronted by a recursive loop. (Miller, Galanter, and Pribram, 1960, pages 26-27)

As an account of action, such a description is deficient. Most basically, it assumes the presence of what needs to be explained, namely action. Such a simplistic application of the cybernetic hypothesis to action tells us little that we do not already know, and nothing of interest. We see someone acting—performing what looks like an instrumental act, such as doing the laundry, feeding the dog, paying bills, attending a concert. We may readily agree that the individual, having experienced some "incongruity," persists in the activity "until the incongruity vanishes." Have we learned anything significant?

Moreover, we likely find it plausible that separate instances of the "same" action—of doing the laundry, for example—carry different meanings for an individual and, across individuals, are experienced variously. Presumably, the "cybernetic hypothesis" applies in all instances. Similarly, we may observe multiple encounters with what look like the "same" perturbing conditions—a hamperful of laundry, for example—and find little uniformity of action within or across individuals.
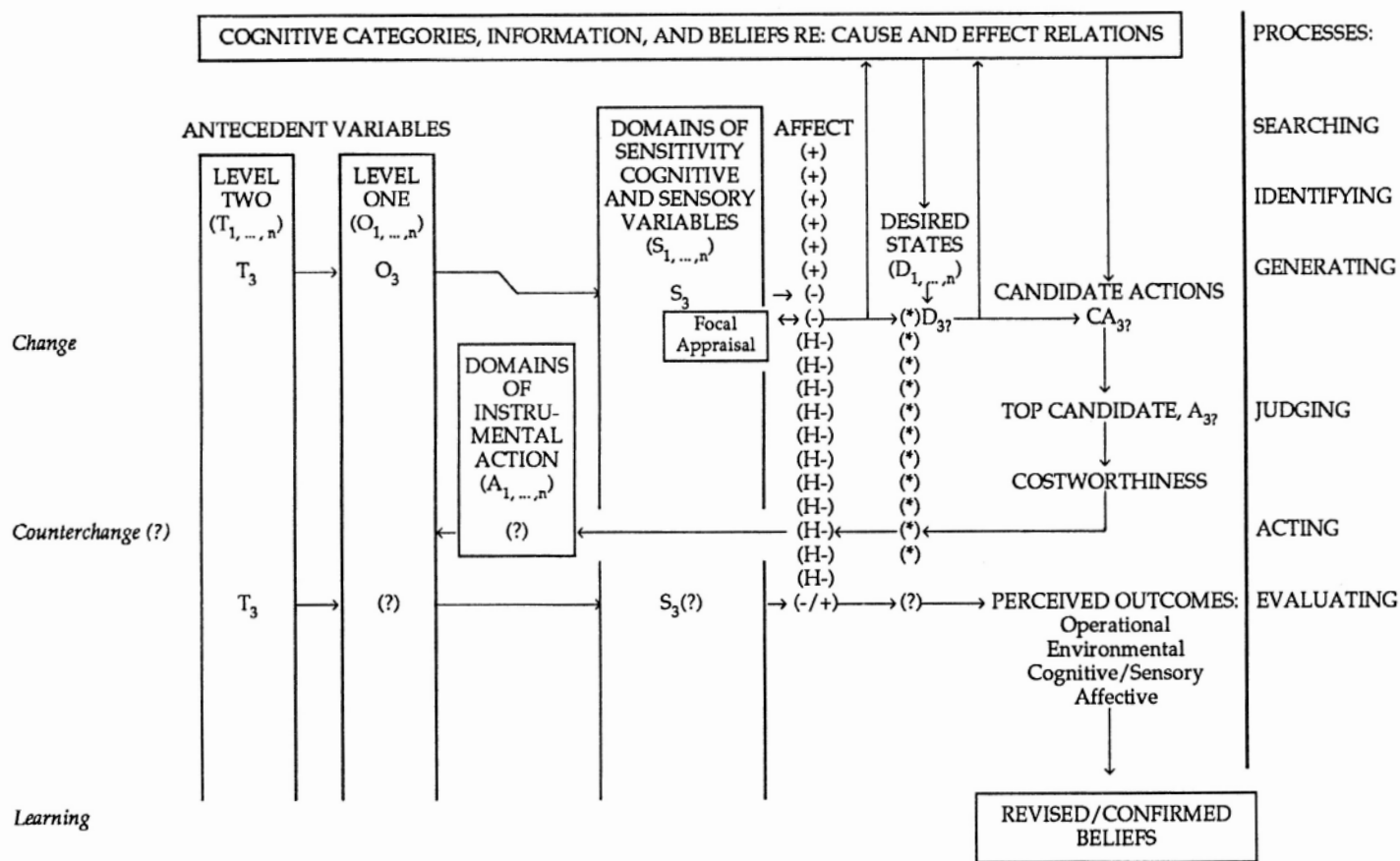
The "cybernetic hypothesis" is an improvement over the simplistic stimulus-response *(S-R)* notion of the reflex arc. To understand action we need more, including, minimally, recognizing the *qualitative* connection between perturbing events on the one hand and, on the other, the domain and goal of action.

Three Significant Components of a Behavioral Episode

We may use Figure 1 to discuss some of the special questions that a *behavioral* analysis raises. A behavioral episode consists of three significant components: Change, Attempted Counterchange, and Learning. If an individual acts (attempts to effect counterchange), he or she is trying to make an adjustment of some sort. The *kind* of adjustment is specified by a preceding *change.* There is no guarantee that action will achieve what an individual intends, so we speak always of *attempted* counterchange. Whatever the outcome, *learning* occurs. Let's look more closely at change and attempted counterchange.

Change

An individual's resources are always allocated to one substantive domain or another. Events occur all around us—a leaf falls and a squirrel is startled—but not all events initiate a (human) behavioral episode. Only those may do so that affect *domains of sensitivity,* i.e., cognitive and sensory variables $(S_{1,...,n})$, certain values of which compel an individual to allocate resources and to consider making some adjustment. Two levels of antecedent conditions are relevant: Level One, variables that immediately affect the status of variables in do-

COGNITIVE CATEGORIES, INFORMATION, AND BELIEFS RE: CAUSE AND EFFECT RELATIONS　　PROCESSES:

ANTECEDENT VARIABLES

SEARCHING

IDENTIFYING

DOMAINS OF SENSITIVITY COGNITIVE AND SENSORY VARIABLES $(S_{1,...,n})$

AFFECT

LEVEL TWO $(T_{1,...,n})$

LEVEL ONE $(O_{1,...,n})$

DESIRED STATES $(D_{1,...,n})$

GENERATING

T_3　→　O_3

$(+)$
$(+)$
$(+)$
$(+)$
$(+)$
$(+)$
→ $(-)$
↔ $(-)$ →$(*)D_{3?}$ — CANDIDATE ACTIONS → $CA_{3?}$
$(H-)$ $(*)$

S_3

Change

Focal Appraisal

DOMAINS OF INSTRU- MENTAL ACTION $(A_{1,...,n})$

$(H-)$ $(*)$
$(H-)$ $(*)$
$(H-)$ $(*)$　TOP CANDIDATE, $A_{3?}$　JUDGING
$(H-)$ $(*)$
$(H-)$ $(*)$
$(H-)$ $(*)$　COSTWORTHINESS
$(H-)$ $(*)$

Counterchange (?)　　(?) ←　　$(H-)$← $(*)$←　ACTING
$(H-)$ $(*)$
$(H-)$

T_3　→　(?)　→　$S_3(?)$　→ $(-/+)$ — → (?) — → PERCEIVED OUTCOMES:　EVALUATING
　Operational
　Environmental
　Cognitive/Sensory
　Affective

Learning

REVISED/CONFIRMED BELIEFS

1. When *Change* occurs, the interrupting mechanism is one's experienced sense of unease, represented by (-). That unease attracts focal attention. The mind is "bent" to ascertaining what is wrong or what needs to be different to not feel unease, or, if that is obvious, what is necessary to put things right again, and how to do this. While all this is happening, the feeling of unease (-) is still present; however, once there is a focus on doing something about it, the awareness of unease is accompanied by a feeling of hope (H). Hope and unease continue until feedback is obtained, following an attempt to effect counterchange.

2. The question marks indicate that, from the perspective of the acting individual, before obtaining feedback from action, the outcome is uncertain.

3. Focal appraisal has a double arrow to show that the individual is not just being acted upon, but is actively searching and comparing.

Figure 1. A Behavioral Episode

mains of sensitivity; and Level Two, variables that, in regard to a focal episode, affect an individual only indirectly, i.e., through their effect on values of Level One variables. Variables at Levels One and Two may be personal or environmental.

Consider, for example, individuals who become aware of the sensation that their body is cold (sensory variable); Level One elements include the temperature of the air adjacent to the skin and the equilibrial value of skin temperature, and Level Two elements include weather conditions and provisions the individuals made for shelter. Or consider individuals who, learning they are in the path of a hurricane that is close, understand they are in danger (cognitive variable); Level One elements include components of the message, such as perceived forecaster reliability, closeness of the storm, and its estimated strength, and Level Two elements include the weather forecasting system and atmospheric conditions (see Figure 2).

Change occurs when values of level one variables are such as to cause variables in domains of sensitivity to assume values outside their equilibrial ranges. An individual is alerted to the fact that *change* has occurred by experiencing a characteristic affective quality—an insistent unpleasantness, with accompanying cognitive message: Attend!

LEVEL TWO	LEVEL ONE	SENSITIVE DOMAIN
Weather conditions and provisions made for shelter	Air temperature at skin; equilibrial values of skin temperature	*Sensory,* e.g., sensations of cold
Forecasting system; atmospheric conditions	Message of reliable weather forecaster	*Cognitive,* e.g., danger is present

Figure 2. Examples of Elements Implicated in *Change*

Attempted Counterchange

Once an individual's resources are thus focused on the possibility that some adjustment is needed, s/he may appraise the situation focally. The outcome may be a decision that no further allocation of resources is required. The behavioral episode terminates. Otherwise, a *desired state* (D_3) exists in principle, i.e., some state that lacks whatever has initiated the behavioral episode. The individual wishes the present state were other than it is. To effect counterchange, s/he must know which sensitive domain (S_3) has been perturbed, i.e., moved outside its

equilibrial range, or, minimally, which kinds of actions (CA_3) are likely to render it quiescent. *Searching* the current environment and memory for relevant information, the individual engages in cognitive acts such as *identifying* the essential characteristics of desired states, *generating candidate actions* (i.e., what to do to bring about the desired states, and what it is possible to do in the present instance), *judging* the relative strengths/weaknesses of candidates, if more than one, and the costworthiness of the sole or top candidate. As an individual engages in trying to effect counterchange, *hope* mutes the feeling of discomfort.

Attempts to effect counterchange may have a variety of outcomes. The selected action may be impossible to perform because the environment is not as the individual believed it to be. (The sweater is not in the closet.) In such a case, the decisional process reverts to some appropriate earlier stage, and continues as before. Or, putting on the sweater, after a little while the cycle may start again because the sweater is inadequate. Or, putting on the sweater and becoming warmer, after a little while the individual may again experience activating discomfort and realize that s/he misdiagnosed the problem—the sensation first interpreted as "being cold" was due less to air temperature than to nagging anxiety about an unresolved problem.

Action as Counterchange

Of all the events that occur in the universe—both within as well as outside the skin of human beings, only those that affect domains of sensitivity raise the possibility of *behavioral* regulation (i.e., regulation that involves, actually or potentially, an individual's focal attention). For behavioral regulation to be effective, an individual must choose appropriately from a grand universe of all possible acts ($A_{1,...,n}$). Figure 3 represents successful action as directly regulating conditions at Level One. However, by no means is it a foregone conclusion that an individual chooses, or is able to effect, an appropriate act (e.g., A). Figure 1 suggests some points at which an individual may fail to make the correct connections, where "correct" is specified by Level One events: Does an individual correctly choose desired states ($D_{3?}$), candidate actions ($CA_{3?}$), and intended means of effecting interchange ($A_{3?}$), and is the environment as the individual believed it to be?
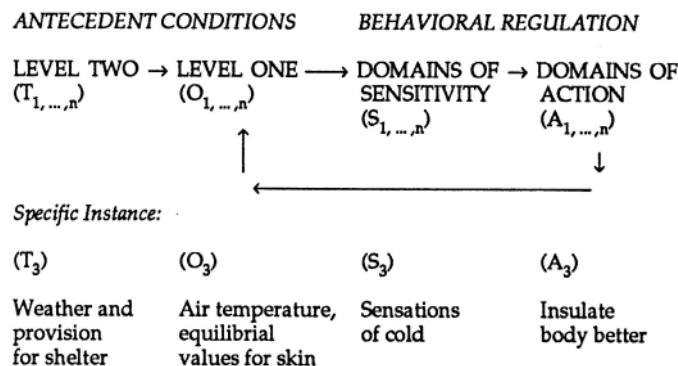
Figure 3. Elements in Resource Allocation and Use

Ambiguity of Action

The ambiguity of action is multifaceted. When events compel an individual's focal attention, raising the question of effecting some adjustment, the source of perturbation may or may not be clear to the individual. If individuals err in identifying the attributes of desired states, the subsequent course of effecting counterchange is likely to be misdirected. Not infrequently, individuals are unclear about the nature of events upstream from the point at which they have identified a goal and a domain of action.

Beyond the ambiguities that an actor may experience, the natural history of an act is notoriously opaque to an observer. We see an individual reach for and put on a sweater. We may have little information and no certainty about the candidate actions the individual considered, or the domain of sensitivity, or the Level One and Level Two variables that were operative (Figure 4). The relevant domain of sensitivity may be the sweater's warm-making characteristics or its imagined impact on the way others may evaluate the actor. In fact, this actor experiences a sensation of cold. Operative events at Level One may be a drop in air temperature or low blood sugar. As regards a drop in air temperature, operative events at Level Two may be a broken thermostat/furnace/window, a dry fuel tank, or a sudden change in the weather. In large part, the baffling quality of human action derives from states of affairs as illustrated by Figure 4, reading from right to left.
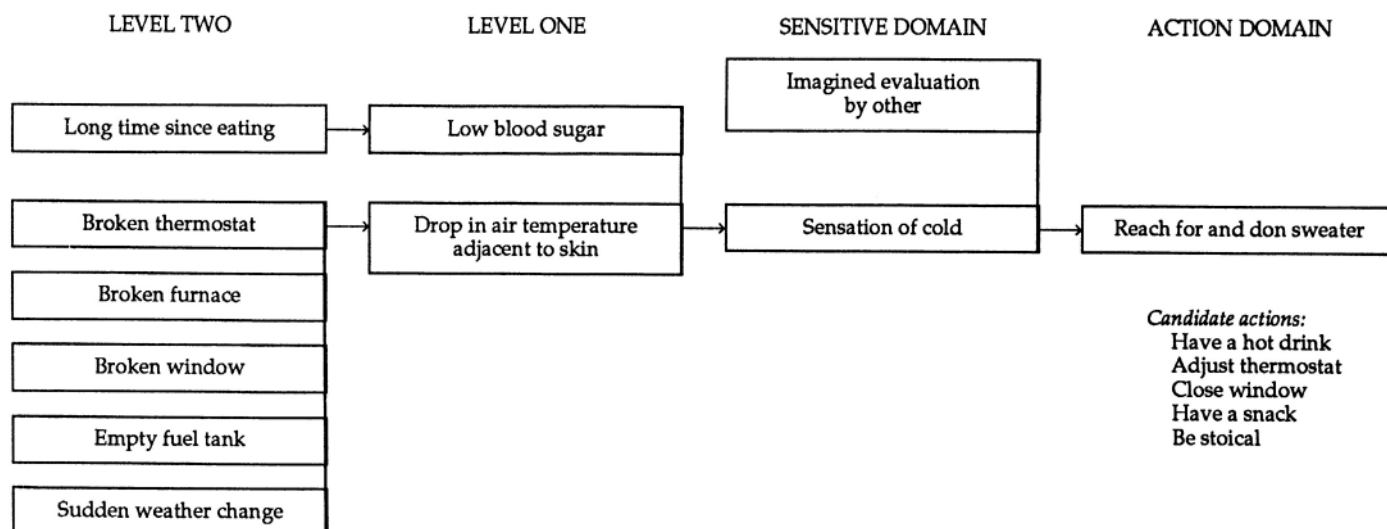

Figure 4. Some Antecedents for the Act: "Reach For and Don Sweater"

Or, take an event such as a hurricane warning. Depending on the meaning individuals attach to such a message, it may or may not operate as a Level One variable that activates a sensitive domain. And if it does, we shall likely fail to predict the specifics of attempted counterchange for each of a number of individuals for whom it initiates a behavioral episode.

How may we best represent the sources of action's ambiguity?

Reference

G.A. Miller, E. Galanter, and K. Pribram, 1960, *Plans and the Structure of Behavior,* Holt, Rinehart and Winston, New York.

Cybernetics and Traditional Symbolism

By Mark Siegeltuch (20 Dongan Place, New York, NY 10040). Copyright 1987 by Mark Siegeltuch.

Paul Schroeder asks in *CC* #12, "Can cybernetics extend to traditions of thought which include Pythagoreanism, neo-Platonism, medieval alchemy, and traditional metaphysics?" I have been interested in this issue from the time I studied medieval history in college and found the traditional academic approach to be severely limited. I offer the following observations:

There are several areas where a cybernetic or systems approach has been of some help in explaining matters which have resisted the analytical methodologies of scholars, psychologists, and philosophers.

Jacques Lusseyran, blind from childhood, writes in *And There Was Light* (Little Brown and Co., Boston, 1963, page 144):

From my experience I knew very well that it was enough to take from a man a memory here, an association there, to deprive him of hearing or sight, for the world to undergo immediate transformation, and for another world, entirely different but entirely coherent, to be born. Another world? Not really. The same world rather, but seen from another angle, and counted in entirely new measures. When this happened, all the hierarchies they called objective were turned upside down, scattered to the four winds, not even like theories but like whims.

One task of information theory is to explore the symbolic context in which human expression takes place. Or, to use Lusseyran's terms, to see what measures our ancestors used to build their world. We need to learn how to distinguish systems of meaning, much as mathematicians do.

Traditional cultures are oral cultures whose thought processes are foreign to us. Folklorists study "motifs" and art historians "iconography" because information was organized and transmitted differently in the past. This may sound like a trivial observation, but it lies at the heart of the problem. We are constantly betrayed by our own categories—history, psychology, economics, poetry, art, religion—which have meaning in our world, but do not "map the territory" we are exploring. The substructure of the oral world does not fit our procrustean bed of historical periods or even separate cultures. The ancient cultures of the world seem to be built upon a single *urmythos* which is the common inheritance of mankind.

Most of our knowledge of these cultures comes to us through the double-edged sword of writing. Without writing, we would have no history or context for understanding the past. Yet it was writing which first exfoliated, and then destroyed, traditional forms of expression. We would do well to consider the central role of memory in oral cultures. This is a problem which contains all of the classical issues in communications theory: entropy, redundancy or repetition, coding, form, and pattern. Put most simply, how do people maintain their culture in the absence of writing?

Another approach can be found in Gregory Bateson's article in *Steps to an Ecology of Mind,* "Style, Grace, and Information in Primitive Art," where the notion of primary process (borrowed from Fenichel and the psychoanalysts) is used to get at the metaphoric basis of traditional symbolism. (Bateson returned to this idea in *Angels Fear* when he discussed the "syllogism in grass.")

Man began as a metaphysician and only in very recent times gave up a speculative or idealistic view of life for a realistic or scientific one. But the metaphors of the ancients are not like the metaphors of our writers and artists. They are not willful or self-expressive, but are more akin to mathematics in their precision of expression and consistency of relation. In the language of information theory, they might be termed "isomorphic" in relation to their prototypes, which is simply a fancy way of restating Plato's theory of forms. Thus we find that Jack's beanstalk is formally identical to Jacob's ladder, though each is tailored for a different audience.

By the same token, the inventions of mankind (plows, bows, pottery, needles, weaving, knots, etc.) are applied metaphysics. The eye of the needle is the entrance into heaven, and the thread is the spirit. These "figures of thought" find expression in all kinds of media. They are applied wisdom rather than applied knowledge.

What is of particular interest to the systems theorist is the ability of traditional symbols to retain their meaning (i.e., their internal structure and organization) despite all the variations and adaptations to which they have been subjected. As long as the formal arrangement of parts within a story or drawing has not been disrupted, the symbol remains intelligible, like a cipher or code. They are truly well made and have a symmetry and balance, to borrow Schroeder's words.

Let me end with a word of caution. Scholars have popularized the worlds of folklore and symbolism (Frazer, Campbell, Eliade); writers and poets have borrowed from them (Shakespeare, Joyce, Yeats); painters have copied their images (Picasso, Klee, Miro); psychologists have theorized upon them (Freud, Jung, Bettelheim) as have numerous sociologists, anthropologists, and historians, of all persuasions. They have been linked to astrology, ancient astronomy (Marshack), the occult (whatever that is), and extraterrestrials (whoever they are). It is hard to believe that our ancestors, who could neither read nor write, shared all of these interests with us. My point is this: there is a difference between using this material and understanding it.

If cybernetics is to be of use in the interpretation of traditional symbolism, it must not be an exercise in applied theory. Clearly, there are patterns in knot designs, mandalas, cave drawings, and carvings on bones. I have no doubt that these patterns are not accidental, but are part of ordered systems of meaning which were understood at one time.

Cybernetics, as I encounter it in the pages of *Continuing the Conversation,* is a highly abstract discipline. Traditional symbolism is the product of cultures which had little or no ability to abstract. I have seen the types of misunderstandings which can be generated when modern philosophy is used as a bridge to understanding medieval scholasticism. I see the same potential for error here. This is not meant to discourage anyone, but to emphasize the need for fidelity to source material when developing theoretical models.

Special Fall 1988 ASC Conference

"Texts in Cybernetic Theory: An In-Depth Exploration of the Thought of Humberto R. Maturana, Ernst von Glasersfeld, and William T. Powers" is scheduled for October 18-23, 1988, at Felton, California (near Santa Cruz). Designed to provide an opportunity for informal, serious study of three viewpoints in cybernetics, this conference will devote each of the first three full days to reading, examining, and discussing a specific text embodying the primary ideas of one of the theoreticians. Each day's author will respond to questions of explication arising from small-group study, and will provide additional elaboration of his theoretical viewpoint and its implications in an evening lecture accompanied by further questions from the floor as well as general discussion. The aim of each "author day" will be to *understand* the author's viewpoint. The final day and a half will engage the authors in dialogue and discussion of issues that have emerged in the previous days.

In addition to promoting a deeper understanding of three major points of view in cybernetic theory, the conference provides three of our theorists with the rare opportunity of being heard very carefully, while simultaneously offering each participant an opportunity to examine more deeply his or her own theoretical constructs. In short, the conference aims to foster a context in which all of us can learn and explore together, freeing each other from the stifling mode of "my ideas against your ideas" and instead working together against the ideas to clarify as fully as possible some *of* the major current ideas in cybernetics.

The three conference texts will be mailed to participants when they register, and everyone will be expected to have read each of the papers thoroughly prior to arrival at the conference. At the same time, since the whole point of the conference is learning together, prospective participants should not let relative lack of familiarity with one or more of the theoretical viewpoints prevent their attendance. Also, out of courtesy to our speakers and to the total weave of the conversation, all participants are expected to attend the entire conference, and there will be no late arrivals.

To promote informality, the conference will be held at Mt. Cross Camp, a relaxed setting offering 102 acres of hiking trails, a swimming pool, basketball, volleyball, and baseball. *Participants must bring their own sleeping bags, pillows, soap, and towels.* (All of the rooms have beds with mattresses, but no bedding.) A limited number of Lodge facilities hold 2-3 persons per room, and the dorms and cabins hold 6-16 persons per room; every effort will be made to see that there are, in general, no more than 8 persons per room. Dress will be highly informal.

Preferably, participants should fly into San Jose, or, if necessary, San Francisco. There will be a single bus which will transport participants from and to the airports. Additional bus information will be forthcoming.

Conference Fees, Including Lodging and Meals

	1988-Paid ASC Members	1988-Renewals/New Members
Before August 15	$275	$325
After August 15	$300	$350

Full-time students who send proof of status may subtract $50.
$30 more for Lodge space (limited, available on a first-come, first-serve basis).

All conference registration forms and accompanying checks must be received by *September* 15. There will be no registration at the conference site. Registration forms, with checks made out to "American Society for Cybernetics," should be mailed to Larry Richards, Department of Engineering Management, Old Dominion University, Norfolk, VA 23529-0248. All registrants will be sent the three conference texts as soon as their checks and registration forms are received; others may order the texts from Larry Richards for $21, including postage. Refunds will be given to anyone unable to attend if a letter of request for refund is forwarded, together with the original Receipt of Registration

Form, to Larry Richards by October 10, 1988. Refunds will be processed after the conference, and a $50 processing fee will be deducted.

Questions regarding the conference or the accommodations should be directed to Rod Donaldson, P.O. Box 957, Ben Lomond, CA 95005, phone 408-338-9057; questions regarding registration, conference texts, or possible conference scholarships should be directed to Larry Richards or Fred Steier, Department of Engineering Management, Old Dominion University, Norfolk, VA 23529-0248, phone 804-440-3758.

"Support, Society, and Culture"

This conference, with the theme "Mutual Uses of Cybernetics and Science," will be held in Amsterdam, March 27 through April 1, 1989. Sponsors include the American Society for Cybernetics, the Cybernetics Society (Great Britain), the Dutch Systems Group, the International Federation for Systems Research, and the Program on Support, Survival, and Culture at the University of Amsterdam. The development of the theme is to discover how the two areas of cybernetics and science may be allowed to interact creatively and generously—to allow for mutual survival by the creation of the cultural context within which they both may and will give to each other.

To approach this intention, the following areas can serve, for instance, as sub-themes: Reality and Its Construction; Assistance, Interaction, and Identity; Integrity, Method, and Tools; Society and Formalism; Growth and Support; Knowledge, Action, Interaction, and Continuity; Methodologies in Cybernetics/ Systems Theory and in Science.

In order to help facilitate productive interaction by participants at many levels, the Conference organizers hope to have designed a suitable milieu and ambience, organized around, and embodied in, three constituents. The first is the established means of paper sessions, with formal presentations and subsequent publication of papers modified by the authors following the conference in a "Proceedings." Papers for presentation in this manner will be refereed by the program committee and, where necessary, others, on the basis of abstracts *received by October 14*, 1988, and/or full papers *presented by February 10,1989.* The second is a less well-established though frequently used approach, for which interesting additional technology now exists. There will be discussion sessions, each to be led by an invited, distinguished academic, contributing introductory papers on the conference theme. The papers will be distributed to participants before the conference. Each event will be recorded verbatim, and transcripts will be made available, together with computer editing facilities. Revised transcripts will form the basis for a "Second Proceedings." Third, there will *be* a social milieu in which participants may relax, discuss, meet informally, enjoy life, dance, dispute, and generally interact.

The conference is organized and chaired jointly by Dr. Ranulph Glanville (Portsmouth Polytechnic and University of Amsterdam) and Prof. Dr. Gerard de Zeeuw (University of Amsterdam). Requests for further information and other questions should be directed to the conference co-coordinator, Ms. Joop Muller, Programma Ondersteuning, Overleving en Cultur, Grote Bickersstraat 72, 1013 KS Amsterdam, THE NETHERLANDS, phone [31]-(0)20-525-1250.

Control Systems Group Meeting

The fourth annual meeting of the Control Systems Group is scheduled for September 28-October 2 1988, at a retreat near Kenosha, Wisconsin. For more information about the meeting, or to join the CSG (dues are $10 per year, including a subscription to the Group's newsletter), write to Edward E. Ford, 10209 *N.* 56th St., Scottsdale, AZ 85253.

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Continuing the Conversation

A Newsletter of
Ideas in Cybernetics

Terrorized Angel Seeks Guidance

By Rafael Ramirez (2 Villa Robert Lindet, 75015 Paris, FRANCE). Copyright 1988 by Rafael Ramirez.

In 1987 I defended a Ph.D. dissertation at the now defunct Social Systems Science Department at the Wharton School of the University of Pennsylvania. I took the "Ph." part of my doctoral studies seriously and actually did some philosophy. The "field" of philosophy I ended up working with was (is) aesthetics. The title of the dissertation is "Towards an Aesthetic Theory of Social Organization." The fact that I could do this in such a setting was facilitated by my having had a singularly supportive dissertation committee.

I started my research by trying to find out what experiencing an organization as being "beautiful" says about the organization (i.e., about how such a social entity is designed or "organized"). I had found certain organizations beautiful, and I had encountered people who claimed that they had actually joined organizations because they found what the organization did was "beautiful." Yet no organizational theory that could explain this was available.

After a while, it became evident that the first research strategy is equivalent to attempting to find the recipe whereby necessary and sufficient conditions for ending up with a "beautiful" organization can be determined. This is not "on," not only "in" organizational theory, but also elsewhere: in music, painting, or whatever. So I started researching the experience itself—the relationship between researcher/subject/actor and organization/object. As you may surmise, this really meant doing second-order cybernetics research, as well as entering all kinds of unknown territories, such as perception psychology and neurobiology. Unlearned as I was in all of these fields, I used my ignorance as an asset and managed to use some of the things which I found there to relate Bateson's mysterious "responsiveness to the pattern which connects" to both neo-Kantian aesthetic philosophy (Cassirer, Langer) and to social systems theory (Buckley, Crozier and Friedberg, Churchman).

To cut a long (600-page) story short, my work led me to argue that knowledge is really "grounded" in experience, and that it relates an "explicitated" way of seeing, a theory (from the Greek *theoros,* meaning "to behold"), to something that is seen, evidence (from the Latin *videre,* meaning "seeing"). Indeed, science as *we know it* is nothing but a description of the relationship or fit between descriptions of the way of seeing and what is seen. All that distinguishes scientific knowledge from the knowledge obtained by, say, excellent investigative journalism, is that the theory must be described in ways that allow for *replicability* (of the way of seeing by another party) and for *generalizability* (so that the theory can fit a class of entities fitting the description of the original evidence). Such science (again, as we *know it)* is as counter-inductive as it is inductive. Note, however, that if I discard positivism, my position is also different from that of the radical constructivists (who are really like Bishop Berkeley). The resulting philosophy of knowledge means that in order to know, there is necessarily both one or more subjects/actors/experiencers and the presumption by these parties that there is something "out there" that is "given" (data, from the Latin *dare,* "to give"), but which is knowable only in interaction with it. Thus a fact (from the Latin *factum,* "to make") is *made in experience,* and what is known, the *object of the experience,* is "made" by the subject in acting/experiencing/relating to what is given. The fact is but an aspect of what is given, and what is given can only be known in this experientially dependent way.

With this framework, it was then possible to investigate why certain of these "knowing" experiences have an "aesthetic" aspect (or dimension or element or feeling). Let us for the moment, and for simplicity's sake, say that this "class" of "knowing" experiences includes those in which we (the "knowers") find the object which we experience (and which is constituted in the experience) "beautiful." Note in passing that posing the research problem in this way inverts the way the problem is put in, say, the sociology of art. There, the problem is to identify why certain classes of people find some class of objects/experiences "beautiful," whereas other classes of people do not. This kind of research assumes that people actually do find things beautiful (without exploring why this is so), but seeks to determine why different types of people find different kinds of objects so. In my case, I put aside the possibility of different types of people finding different experiences/objects "beautiful" (admitting/assuming that this may indeed be so), and instead I concentrated on finding out *why* (at least some, and apparently all) people find some thing(s)/experience(s) "beautiful" in the first place. In other words, why is this (aesthetic) kind of experience "there" for us?

To deal with this, I followed Cassirer's and Langer's work regarding the way we represent our experiences: the way we symbolize. Two broad types of symbols are in evidence: what they call "discursive" symbol-making and what they call "presentational" symbol making. The first involves a denotative semantics that allows for dictionaries, and meaning is attached to the one-to-one referent between symbol and what is symbolized. Language and mathematics are examples. Presentational symbols, on the other hand, are "meaningless" if understood in this way. Their "meaningfulness" (in quotes because their significance is other than the "meaningfulness" that discursive symbol-making offers) rests in how they relate to the whole in which they are embedded. There is no denotation, and dictionaries are impossible. A note in a melody in music is an example. A word in excellent poetry is another.

Now, part of my thesis is that we in the West have mistakenly understood "rational" mental activity to consist solely of the activity of symbol-making that is discursive. Presentational symbol-making activity (or "symbolification," as Langer calls it) has been typically thought of as irrational and/or unconscious. Alternatively, when these "easy" descriptions did not fit the mold entirely (Beethoven's composing, Picasso's painting), we got into a mess by trying to make their evidently "rational" work describable in discursive symbols. This confusion leads to nonsense such as stating that "music is the language of feeling."

Now we have an argument that says rational mental activity includes a different family of symbolification. What, then, is so symbolized? Why did Bateson say that by aesthetic he meant "responsive to the pattern which connects"?

My answer (and here is the rest of my thesis) is that this kind of symbolification deals with an aspect of systems that has been traditionally undervalued and underexplored. Recall that for a system to be a system, its constituent parts are (by definition?) "a part of the whole." Now this really means two things at the same time. It means that the parts are *separate and/or distinct from* (*a-part* of) the whole *and* that they belong to (a part-of) that same whole. I showed that in the West there has been a tendency to overvalue/emphasize the separate/distinct aspect of this relationship, and to underplay the latter. The extent to which this is due to our cultural preference for discursive over presentational symbolism ("the medium is the message" and all that) I did not fully study, although the coincidence does seem remarkable. In any case, my point is that, given that both aspects of the relationship must be "there" for the relationship to "hold," it seems -logical" that our mind will actually recognize both. My thesis is that, as actors in systems, we recognize our "belonging to" systems (the "pattern which connects" us to the system) through presentational symbolism. As you may have guessed, Langer's work is dedicated to showing that presentational symbolification is the way we symbolify beauty. As such, there is an intimate link between the experience of beauty and religious experience.

But from the field work I did, I discovered (in a very tentative way) that while experiencing something in a way in which the experiencing mind symbolifies presentationally may be necessary for aesthetic experience, it is not sufficient. I found two other "conditions" (for lack of a better word) that appear to be necessary for the experience to have this aesthetic aspect (or feeling/element/dimension) to it. The first one is that the experiencing subject/mind appears to find the experienced object beautiful if that object contributes to keeping alive something valued by the experiencing mind. Second, if the experienced object fails to help this valued entity survive, the experience of beauty disappears. A moving story supporting this was told by a colleague of mine, who, as a nine-year-old boy, watched a military parade. He recalls that he *then* experienced the parade as being "beautiful." The boy was German and Jewish, and he managed to escape to Latin America before being exterminated. He grew up to find out what the marchers were really up to, and he told me that upon learning this, the "beauty" element of his recollection was erased. It appears (and more research is needed to confirm this point) that recognizing/experiencing some object/activity as keeping alive something valued is generally accompanied in feeling, and feeling is, as Langer argued, presentationally symbolified.

In this short article, I cannot get "into" all of the ramifications/implications of my research. I can, however, refer readers to the dissertation itself, available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, MI 48106 (catalog number 8725200). I would like to have the dissertation published as a book so that it will be more widely available. Two university presses have so far turned it down. I need guidance as to whom I should address inquiries in this regard. Any suggestions would be most welcome. I guess that some "de-academification" would be of help—but maybe the "raw" version will be of help to second-order cyberneticians and other readers of CC.

Two Experiments
in
Verse-Making

By Irene "K" Staats (30 Winchester Canyon, #68, Goleta, CA 93117). Copyright 1988 by Irene Staats.

Heritage

"Again! This one again!"
Insistent as summer sun,
Dandelions, and morning glories,
Recalling my own imperious,
"Again, Grandpa, again!"
Wondering what is to be
Resuscitated, wreathed,
Transported, connected,
Reconnected, envisioned... ?
Or if "Again!" is here a request
For being breathed?
Autonomically breathed
By that body which is
Larger, larger...
Accepting *Goodnight, Moon*
From your outstretched hand,
Imagining us taken deep into the lungs
Of "The Thinking Beast."
The pattern-making eyes respond,
Connection-maker's voice repeats,
"In the great green room...";
Beginning again, always a novice,
Respecting connections in
"The Thinking Beast";
Imagining a Great Glittering Beast
Stepping from out deep running
Alph, Scattering sacred river water's
Gleaming droplets as its scales ripple,
All scales ebon, golden, ebon, golden scales
Emerald, lapis-pupiled eyes
Winking the scarlet lakes, the cochineal, ...
Looking a Glorious Great Beast, arethusas
Blossoming purple, royal purple where it walks...

But how should I know?
For I am inside reciting,
"... Goodnight stars, goodnight air,
Goodnight noises everywhere."

Stopping Time

I'll choose me a pattern wherein lies a code
For turning an instant into a mode
That is somewhat stable.
In far-off times we will be able
To re-examine, re-construe,
Re-engage a crystallized view
Of a moment ancient, a question new.
Useful as "Once upon a time"
Or the lilting music of a line
Coupled with a clinging rhyme
That's apt.
They're mapped:
Trapped,
As amber trapped the dragonflies
Fossilized for curious eyes.

On Behaviorists, Control Theorists, and Straw Men

By Bryan D. Midgley (Human Development and Family Life, University of Kansas, 1034 Haworth, Lawrence, KS 66045). Copyright 1988 by Bryan D. Midgley.

Richard Marken's (1985) paper, "Selection of Consequences: Adaptive Behavior from Random Reinforcement," reports an experiment in which subjects seated in front of a computer terminal were instructed to guide an on-screen cursor toward one of three stationary targets by means of a keyboard space bar. The subjects could not control the direction of the cursor—it moved at a constant rate in a straight line, and randomly changed direction whenever the space bar was pressed.

Subjects' performances were measured by the direction of cursor movement relative to a target—the angle between an axis extending through a target and cursor before a bar press and the line of trajectory of the cursor after a bar press. The experimental results indicated that the larger the angle (between 0° and 180°, with 0° indicating cursor movement directly toward a target, and 180° indicating cursor movement directly away from a target), the greater the probability of response. In brief, the greater the direction of cursor movement away from a target, the more likely a subject was to respond. All subjects were relatively successful in keeping the cursor within range of a target.

Marken's conclusion was that the behavior-analytic concept of "selection by consequences" (e.g., Skinner, 1981) did not hold, given the data of his experiment. That is, according to Marken, "all bar presses are equally reinforced" (1985, page 382). If the subjects were bar pressing simply because of reinforcement, then "the cursor would eventually have wandered off the screen" (page 380). Marken attributed the subjects' behavior to something other than reinforcement when he declared: "It appears that the subjects are pressing the bar with the *purpose* of keeping the cursor near one target" (page 380). Although I do not intend to argue for the appropriateness or inappropriateness of a control theory explanation for Marken's data, I do intend to point out that Marken's account of a behavior-analytic explanation is, at least, severely limited, and, at most, a misrepresentation. I begin with a general comment.

Marken states: "Reinforcement theory [behavior analysis], committed to the notion that the appearance of purpose is an illusion, would attribute the [experimental] results to differential reinforcement of bar pressing" (page 380). First, behavior analysis is not committed to the notion that the appearance of purpose is an illusion. Skinner, himself, has stated that "operant behavior is the very field of purpose and intention" (1974, page 56). No doubt, control theory and behavior analysis treat the construct of purpose differently, but that is no reason for either side to ignore (or misrepresent) the conceptual position of the other. Second, when Marken says that behavior analysis would attribute the experimental results to differential reinforcement, he is partially correct. Marken fails, however, to distinguish between discriminated and nondiscriminated operant behavior; but this leads to my more specific comments.

From a behavior-analytic perspective, Marken's experiment is more accurately presented as an example of *discriminated* operant behavior (e.g., Catania, 1984, pages 126-157; Michael, 1980; Skinner, 1953, pages 107-128). The operant three-term contingency is a construct well-known to all behavior analysts, and it is the very essence of discriminated behavior. In brief, the three-term contingency describes a relationship between three variables: a discriminative stimulus (S^D), an operant response (R), and a reinforcing consequence (S^R). The discriminative stimulus is said to set the occasion for an operant response. In other words, a response made in the presence of a discriminative stimulus is likely to be reinforced, whereas the same response made in the presence of a different stimulus (an S-delta, S^Δ) is not likely to be reinforced. Eventually, responses become more likely in the presence of a discriminative stimulus than in the presence of an S-delta.

In the analysis of his experiment, Marken fails to recognize the dual function of the stimulus-setting: "If maximum reinforcement is defined as the direction which produces the highest probability of a response, then the angle that is most reinforcing is the one pointing away from the target" (page 382). Actually, an angle pointing away from a target (180°) is a discriminative stimulus, and an angle pointing toward a target (0°) is an S-delta (with the angles from 0° to 180° functioning gradually more as discriminative stimuli and gradually less as S-deltas). Regarding consequences, an angle pointing toward a target is a positive reinforcer, whereas an angle pointing away from a target is a punisher.

With respect to the three-term contingency $S^D \rightarrow R \rightarrow S^R$, then, cursor movement away from a target is a discriminative stimulus (S^D) for a bar press (R). The consequence will be to move the cursor either closer to or farther from a target. The consequence, however, results in a different stimulus-setting. If the cursor is farther from a target, then it is an S^D, whereas if the cursor is closer to a target, then it is an S^Δ. The apparent paradox that a subject's response rate may not increase after the consequence of the cursor moving closer to a target is resolved by noting that the function of the stimulus-setting has changed from a discriminative stimulus to an S-delta. The cursor in close proximity to a target is a reinforcer, and *under appropriate conditions* a subject's response rate increases. Although a subject's responses are not always reinforced (i.e., sometimes a cursor moves farther from a target), such is the nature of intermittent reinforcement. A proper behavior-analytic description concurs with Marken's data—cursor movements away from a target occasioned a higher probability of responding than did cursor movements toward a target.

Criticism is, of course, a necessary part of scientific development, at the levels of both the discipline and the individual. When it misrepresents other views, however, it probably has little longstanding value, and it may actually hinder development. Behavior analysis, in particular, has a longstanding history of misrepresentation (Todd and Morris, 1983). In the present case, misrepresentation is particularly curious in that experiments similar to Marken's are no strangers to behavior analysis (e.g., Blough, 1958). In fact, Skinner's now well-known "project pigeon" (1960), in which he and his colleagues trained pigeons to function as "missile guidance systems," clearly falls into such a category; but that is another story.

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Reply: And Yet They Seek Goals

By Richard S. Marken (10459 Holman Ave., Los Angeles, CA 90024). Copyright 1988 by Richard S. Marken.

Bryan Midgley joins a long line of psychologists, mostly anonymous reviewers, who claim that I don't understand reinforcement theory (Midgley calls it "behavior analysis"). Most are kind enough to assume that my graduate education was inadequate and proceed to teach me how behavior analysis accounts for my results (no two of these explanations have been the same). Midgley takes a different tack, accusing me of "misrepresenting" behavior analysis on two counts—one, by my claiming that behavior analysis views purpose as an illusion, and two, by my failing to note that the "three-term contingency - can explain my results as easy as pie.

The first calumny can be dealt with quickly. If Skinner said that behavior analysis "is the very field of purpose and intention," then it is so, and I stand corrected. I don't feel that I misrepresented behavior analysis intentionally—my purpose in carrying out this deceit may have been the result of a history of exposure to three-term contingencies which led me to believe that behavior analysis views behavior as being controlled by its consequences. If environmental consequences (in combination with discriminative stimuli, of course) guide behavior toward its goals, then there is not much left for the actor to do. I tend to think of purpose as a characteristic of the actor, not the environment. I guess Midgley and I have a different idea of what purpose is and what might constitute an explanation of purposive behavior. Behavior analysis might very well be all about his kind of purpose.

Which brings us to my second, more serious calumny, which is my failure to point out that my experiment is an example of discriminated operant behavior. Midgley argues that my results can be handled easily by the "three-term contingency" construct, and thus they provide no challenge at all to behavior analysis. By concealing this well-known concept of behavior analysis, I was able to make a rather large theoretical mountain out of an experimental molehill. As proof of this assertion, Midgley offers a fairly detailed verbal explanation of my results in terms of behavior analysis. This must be the correct explanation, since it ends with the following: "A proper behavior-analytic description concurs with Marken's data..." Q.E.D.

I would have more confidence in this claim if the verbal description could be implemented as a set of procedures (such as a computer program) that could actually do what the subjects did—keep the cursor near the target (I have already done this with control theory, as noted in my paper). I invite Midgley to build such a program, based on the tenets of behavior analysis. I have a feeling that he won't be able to get around to it, so I have taken the liberty of doing it for him. (I have invited previous critics to try building *working models* based on their verbal explanations of my results. None have taken me up on this, but all are convinced that they have explained away my results. A curious group, these behavioral scientists.)

The model, like the subjects, must press the space bar with a higher probability after a cursor move away from the target than after a move toward the target. In Midgley's terms, the likelihood of a bar press must be greater after a discriminative stimulus than after an S-delta. How do you change the probability of a bar press (which either happens or not at any instant)? There are several possible approaches. One that seems to be in the spirit of behavior analysis is to assign a probability to each discriminative stimulus and each S-delta, which really refer to different angles of cursor movement relative to the target after a bar press—S^D being angles away from the target and S^Δ being angles toward the target. Now I may be treading on a mystique, but let's call these angles v (ranging between 0° and 180°; angles from 181° to 360° are equivalent to angles from 179° to 0°). Think of v as an integer variable with 181 possible values.

Each value of v is associated with a probability p(v), which represents the likelihood of a bar press following that stimulus. The probabilities are between 0.0 and 1.0. There are several possible initial mappings of p(v) onto the angle v; two are shown below.
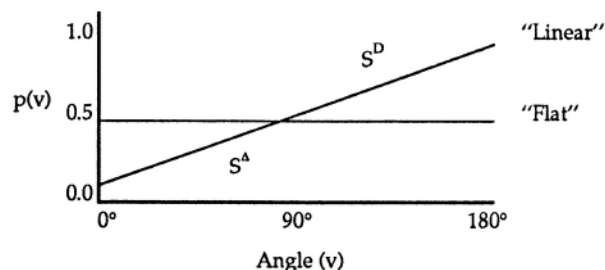
The "flat" function says that the probability of a press is 0.5 after any angle. This would be a good candidate for the mapping of p(v) onto v at the beginning of the experiment. The "linear" function says that the probability of a bar press increases with angle. This makes sense after learning is complete—a press should be highly likely after an angle away from the target (v greater than 90°), and less likely after an angle toward the target (v less than 90°). Note that low values of v correspond to Midgley's S^Δ and high values of v correspond to his S^D.

The result of a bar press is a new angle of cursor movement. This new angle reinforces the bar press and provides a discriminative stimulus for the next bar press. The reinforcing effect is implemented as an increment or a decrement to the probability of a bar press, so that

$$p[v(t)] := p[v(t)] - k[v(t + 1) - 90°] \qquad (1)$$

where p[v(t)] is the probability associated with angle v on trial t, v(t + 1) is the angle occurring after the bar press (on trial t + 1), and k is a constant. (Note that := represents replacement, not equality. The value stored as p[v(t)] is replaced with the right side of equation 1.) The quantity -k[v(t + 1) - 90°] models the reinforcing effect of the angle following a bar press—positive if the cursor is pointing towards the target, negative if it is pointing away (as suggested by Midgley). Thus the probability of a response following a particular stimulus angle is augmented in proportion to the consequence of the response following that stimulus.

The model runs as follows. The cursor is positioned at some random position on the screen. The computer picks an initial angle (v) of cursor movement at random (as it does for the subjects); the cursor moves in a straight line at angle v relative

to the target until the model presses the bar (this is really no more than selection of a new value of v). During the straight line movement, the computer successively generates random numbers between 0.0 and 1.0. When the random number is *less than* the probability associated with the current angle of cursor movement, p[v(t)], the model presses the bar. This results in a new, randomly selected value of v, v(t + 1). This value of v is used as the reinforcer to update p[v(t)] according to equation 1. This process continues for 1000 trials (simulated bar presses).

The behavior produced by this model is a random walk. The cursor may wander toward a target by chance, but it doesn't stay near it for long. This behavior is nothing like that of the subjects who keep the cursor close to one target throughout the entire experiment. Changing the value of k, or its sign, has no effect. It doesn't help to change the initial mapping of p(v) onto v or the nature of the reinforcement function (equation 1). I have tried numerous variations of this model in an effort to compare behavior-analytic and control theoretic models of my results, but with no success.

The behavior-analytic model doesn't just work poorly—it just doesn't work, period. If Midgley thinks this model is an inappropriate representation of the three-term contingency explanation in his commentary, then he should build a correct model and show where I have erred.

I should note that the model described above will work if we *get rid of the reinforcement effect* (equation 1), and just base the probability of a bar press on the discriminative stimulus v, using the linear probability function. This seems to salvage the "stimulus control" aspect of behavior analysis, but even this is a mistake. The "stimuli" have been defined as angles *relative to the target.* But, as I noted in my original paper (page 383): "What is not being considered is why movement relative to *that* particular point [target] is significant. The cursor moves relative to *all* points (including the three target points) all the time." Suppose that the cursor suddenly stays near a different point on the screen (as it will if, prior to the experiment, the subject is asked to change targets occasionally)? I concluded that the significance of any particular point is determined by the subject—the subject selects a goal point (target) and controls cursor movement relative to this goal. The alternative is to imagine that the stimulus has changed *its* goal—but this approach requires abandoning too much physics for my taste.

Sometimes a scientific observation is made that is totally inconsistent with our current understanding of some natural phenomenon (the Michelson-Morley experiments come to mind). Such results can give impetus to the development of new theories and models, but, most likely, they will be put on the back burner for a while, especially when current models work well (Newtonian physics, for example). Nevertheless, such results are at least recognized, at the time, as posing a significant problem for current theory.

The results of my harmless-looking little experiment are completely inconsistent with the notion that environmental events (discriminative stimuli and/or reinforcing consequences) can produce purposive, goal-oriented behavior. I can understand those who want to ignore a result that is inconsistent with the current *Zeitgeist* (although my contemporaries are in a better position than those of Michelson and Morley, who didn't yet have relativity—mine have control theory, if they want it). However, I cannot understand scientists who refuse to do the calculations necessary to see that a result is actually inconsistent with their own theory. I don't mean this as a personal criticism of Midgley, but, rather, as a criticism of "behavior analysis" in general, which, like a religion, seems unable to deal with the concept of falsifiability.

Comment: The Trouble with S-Delta

By William T. Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1988 by William T. Powers.

Here, briefly, is what is wrong with Bryan Midgley's explanation of Marken's (1985) operant-conditioning experiment. (I have an interest, as I am co-authoring another paper with Marken on the same subject—a paper now in its fifth round of rejection by behavioristic reviewers, all of whom have given different reasons for rejecting it. We are getting the definite impression that behaviorists just don't like control theory.)

Let's accept the model that Midgley proposes: $S^D \rightarrow R \rightarrow S^R$. Now, can we make it run? Let the screen coordinates (x,y) be such that (0,0) is at the center, the target is at (0,200), and the cursor is at (0,-200). Suppose that the spot is initially travelling "northeast" at 45° to the spot-target direction. It always travels at 10 screen units per second, whatever its direction. According to Midgley, this angle of travel would cause the discriminative stimulus to be changed into an S-delta, by an amount that depends on the angle. The likelihood of responding would decrease (i.e., the delay until the next response would increase) as the amount of S-delta increased. So far, this is essentially the model that Marken and I used.

Now we have to calculate how soon the subject will press the space bar to cause a new random change in direction. We might propose that the delay is proportional to a baseline delay plus an adjustable constant times the cosine of the spot-to-target angle (counting the direction toward the target as 0°). When the angle is 180°, its cosine is -1, and we have a pure discriminative stimulus. When the angle is 0°, its cosine is 1, and we have a pure S-delta. That's basically the form that Marken and I have used, and it has the properties that Midgley appears to propose. Any other law of dependence could be proposed, if Midgley likes. It isn't necessary to come up with *the* law—just a law that will demonstrate the feasibility of the idea.

We finally reach the calculated delay and the subject presses the bar. The new direction is random with respect to the old one: say it is now at 90° from the spot-to-target direction (it could be any direction around the whole 360° with equal probability). This is easy to model: we just use a random-number generator scaled to produce numbers equally distributed from 0 to 359 (the same method used to calculate the new direction during the experiment). Now we need the rest of Midgley's model. We need a rule by which we can calculate the amount of reinforcement due to the new angle. What is the rule by which this amount of reinforcement is to affect the human being? Just what is to be affected? Is it the constant of proportionality that converts angle of movement into the next delay before responding? Is it an amount to be added to the delay calculated from the new discriminative stimulus? I wouldn't want to put words into Midgley's mouth. Precisely what is being proposed here?

If Midgley can tell us how to define the reinforcing stimulus as a function of the new angle, change in angle, or whatever, and if he can tell us what effect (deterministic or probabilistic, absolute or incremental) the calculated amount of reinforcement is to have on the behavior during the next inter-response interval, I would be happy to test this model by running it on a computer and finding values for its parameters that work best. Or Midgley could do this, assuming that programming interests him, and tell us the results.

As matters stand, neither Marken nor I, despite repeated attempts relating to our latest paper, has been able to come up with any answers to these questions that lead to any systematic movement of the model's cursor, much less to movement toward a specific target, and much much less to movement toward a target despite a steady disturbance away from it. This failure might have resulted from our not having found the

right idea. Perhaps there is a way to incorporate the concept of reinforcement into a working model that will behave as the human subjects behave. If Midgley can come up with such a model, I will be happy to explore its properties on an equal footing with control theory models. I don't object to reinforcement theory because I have some magical way of knowing that it is wrong. I object to it because it doesn't seem to work, in terms of the criteria of acceptance I am used to applying to models of behavior (or of anything else).

Rejoinder: Straw Men... Again

By Bryan D. Midgley (Human Development and Family Life, University of Kansas, 1034 Haworth, Lawrence, KS 66045). Copyright 1988 by Bryan D. Midgley.

Upon reading Marken's response to my commentary, I felt like the teacher who grades a well-composed essay only to find that the answer has little to do with the original question. Aside from passing off the issue of purposive behavior, Marken disregards my other comments concerning his misrepresentation of behavior analysis. Marken does discuss a computer simulation, said to be based upon behavior-analytic principles, that fails to replicate the behavior of his human subjects, but to argue that this failed simulation is proof of the futility of behavior-analytic principles is nothing more than another straw man argument.

Regardless, if Marken is willing to share some more detailed information with respect to his computer models, then I am more than happy to listen. I wonder, for instance, if the model he speaks of in his original paper (1985, pages 382-383) is just as interpretable in behavior-analytic terms as it is in control theory terms. Marken, after all, provides only his verbal description of this model.

In general, I question the appropriateness of control theory descriptions of organismic behavior on historical grounds. Although a control system may simulate organismic behavior, models based upon hydraulics and switchboards have also shared a resemblance to organismic behavior. These models (like control theory), however, were based more upon available technology than upon actual behavioral events (e.g., Kantor, 1936.)

If any common ground exists between behavior analysis and control theory (and Powers, at least, seems to think there is some common ground), then Marken would be well-advised to consult relevant behavior-analytic literature(s) (just as behavior analysts would be well-advised to consult control theory literature). For example, although behavior analysis has not developed, quantitatively, to the same degree as other disciplines, neither has it ignored quantitative methods (e.g., Commons, Herrnstein, and Rachlin, eds., 1982; Commons, Herrnstein, and Wagner, eds., 1982, 1983; Commons, Mazur, Nevin, and Rachlin, eds., 1987; Commons and Nevin, eds., 1981).

I sincerely hope that Marken and Powers are not of the opinion that all behaviorists are "against" control theory. Given articles and commentaries like Marken's, however, it is easy to see how some behaviorists find it difficult to be "for" control theory.

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On the Ambiguity of Action

By Mary A. Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1988 by Mary A. Powers.

Geraldine Fennell (in *CC* #13) finds action ambiguous. She finds that the "same" events are experienced in various ways, and at various times call forth a variety of responses or no response at all. How is appropriate action chosen from the "grand universe of all possible acts," given all the possible causes of the events an individual actually perceives, and the vagueness of at least some of the goals he or she has in mind?

All this is very puzzling indeed. However, the puzzle does not arise from the facts as she sees them, but from the model she uses. Although she goes well beyond the simplistic idea that stimuli cause responses, and recognizes the motivating force of a discrepancy between a present and a desired state, I see two major difficulties. One is that, for her, the whole process of deciding what action to take is at a very high, cognitive, aware level, and the other, more fundamental, is her idea that acting is what one actually decides to do.

I have a problem with the first of these because the ability to correct errors (discrepancies between actual and desired states) is, to me, a fundamental property of living systems. Birds do it, bees do it, and so do begonias and bacteria. There are many levels at which to perceive what appears to be a disturbance, and only humans are capable of constructing and operating at some of them. But all living things have the ability in some way to sense and resist disturbances to equilibrial values.

"What is interesting... about action is... what the individual is doing." Amen to that. But what is doing? There is a case to be made that doing is not acting, but perceiving, and what persons are controlling are their perceptions of their actions and the effects of what they do on other perceptions. The only action one can actually perform is the contraction of various muscles. These contractions are immediately immersed in an environment of immense complexity and variability, beginning with the accumulating waste products in the muscle cells themselves, the various positions of tendons and bones that make up the initial posture of the actor, and countless other contributions from the environment, such as gravity and friction. You want to get a sweater out of the dresser, so you contract your fingers around the knobs and pull, hard enough to free the sticky drawer, but not so hard as to drop it on your feet. Which are you controlling, action or perception?

I say you are controlling your perception of doing this by continually perceiving how it is going, by comparing it to how you expect and want it to go, and by varying your effort as

needed. If someone lubricated the drawer glides since you last opened the drawer, you perceive that it is opening too fast, and you counter that error with a push which you intend to be enough to stop the drawer at the position you want. There is no possible way to develop a plan in sufficient detail to anticipate and specify all of the actions required for even the simple sequence of movements called "opening a drawer."

What is specified is an intended perception; in the case of Dr. Fennell's article, being warm enough. How can that be done? Various strategies can be chosen: call the furnace repairman, mend the broken window, put on a sweater. All these strategies can be imagined—memories of various experiences fed back to simulate actual experience. One strategy is chosen: put on a sweater. Why *that* strategy? Probably because other goals are also best satisfied by that particular choice. It's quick. It's cheap. It's Sunday evening and the other strategies aren't possible.

The strategy of putting on a sweater is not a choice of action, but a choice of perception, one level lower than that of the perception of being too cold. How to bring it about? By specifying yet a lower-level perception: getting up and going to the dresser, etc. And that perceived sequence is brought about by specifying still lower-level perceptions, on down to the feel of one's grip on the dresser knobs. Throughout the process, there is continual feedback comparing what is happening to what is wanted. The bedroom door is shut, so you open it. The room is dark, so you turn on the light. Extra unanticipated actions, but each a part of getting a sweater, this time, in your varying environment.

In order to counter a disturbance, it helps to have experience, learning, and memory, all of which can be brought into play to construct a high-level perception such as causation: "I am cold because..." But reasons for a perception are meaningless unless they are perceptions themselves, and it may not be necessary to know what they are, to control perception anyway. A car pulling to the side can be steered straight, whether the cause is a crosswind or a low tire. If you discover the low tire and fix it, it's easier to steer the car. If you find that the problem is a crosswind, you haven't learned anything that will help you steer easier, although you may take care of a big error between an actual and a desired perception: "I think there's something wrong with the car."

It is hard to predict what a person will do if your level of analysis is below the level of the highest perception being controlled by the person; a person will do "whatever it takes" to make present perceptions match, track, and achieve reference states. One way to find out about reference states is to ask—not "what are you doing?" but "why?" "Why are you paying no attention to the hurricane warning?" "Because I think it's just a false alarm, and I'm tired of being fooled," or "I don't want to leave my property," or "I like excitement." These are reference states of greater weight to the individuals involved than the idea that hurricanes are dangerous. Another way is to disturb what you think a person is controlling for, and then see what, if any, countermoves are made. Help a friend load the washing machine by putting a pair of jeans in with the diapers; if your friend doesn't do anything, then he or she isn't controlling for white diapers.

Dr. Fennell asks a question which most behavioral scientists wish would go away: why is behavior so variable? I have tried to answer it in the context of a model, control theory (Powers, 1973), which shifts the emphasis from action to perception. She is seeking a "*qualitative* connection between perturbing events on the one hand and, on the other, the domain and goal of action." The model from which I derive my comments is *quantitative:* the relationships between perception, goals, and action can be expressed mathematically and solved. The solution says that it *is perception* that is matched to desired perception, not action to desired action. If "behavioral cybernetics" is control theory, then that is what is special about it.

Reference

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Quote of the Quarter

Because *CC* #15 will be a special issue devoted to the work of Karl U. Smith and Thomas J. Smith on "The Cybernetic Basis of Human Behavior and Performance," reflections on the following (found on page 186 of *Three Scientists and Their Gods: Looking for Meaning in an Age of Information*, Times Books, New York, 1988) are invited for publication in *CC* #16 (deadline: March 1, 1989).

> It is hard these days to find people who will describe themselves as cyberneticists, and the ones who will are, more often than not, a bit on the mystical side; the moral they draw from Norbert Wiener's book is that everything, ultimately, is connected by information with everything else, and, like, feeding back off it, you know?

1989 ASC Meeting: *CONNECTIONS*

Christoph Berendes, Fred Steier, and many others are instigating *CONNECTIONS,* the 1989 Meeting of the American Society for Cybernetics, at Virginia Beach, Virginia, October 25-29, 1989, and *we need to hear from you*, now:

> If you plan to come to the conference to learn, tell us what you'd like to learn.

> If you're coming to the conference to be heard, tell us what, how, and to whom you'd like to say it.

> If you're coming to experiment, tell us how to set up your laboratory.

We envision a conference where old boundaries become points of contact, familiar controversies are replaced by new distinctions, and differences lead to conversation. Our preliminary list of themes includes:

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understanding systems development
approaches to ecology
conversation, representation, and knowledge
systems dynamics
planning (non)viable systems
roles and society

</div>

As well as family systems and therapy, rigorous approaches to problem framing, language and management, learning and telecommunications, and scientific methods. For each of these, we are seeking theme coordinators.

To explore the ways in which cyberneticians connect, we encourage you to develop new formats and expand old ones; we are considering video conferencing, participatory laboratories, symposia, performances, tutorials, paper sessions, and a cybernetics fair.

We invite your participation. Begin by contacting: Christoph Berendes, Center for Cybernetic Studies of Complex Systems, Old Dominion University, Norfolk, VA 23529-0248; phone 804-683-4558 or 804-440-8758.

"Support, Society, and Culture"

This conference, with the theme "Mutual Uses of Cybernetics and Science," will be held in Amsterdam, March 27 through April 1, 1989. Sponsors include the American Society for Cybernetics, the Cybernetics Society (Great Britain), the Dutch Systems Group, the International Federation for Systems Research, and the Program on Support, Survival, and Culture at the University of Amsterdam. The development of the theme is to discover how the two areas of cybernetics and science may be allowed to interact creatively and generously—to allow for mutual survival by the creation of the cultural context within which they both may and will give to each other.

To approach this intention, the following areas can serve, for instance, as subthemes: Reality and Its Construction; Assistance, Interaction, and Identity; Integrity, Method, and Tools; Society and Formalism; Growth and Support; Knowledge, Action, Interaction, and Continuity; Methodologies in Cybernetics/Systems Theory and in Science.

In order to help facilitate productive interaction by participants at many levels, the Conference organizers hope to have designed a suitable milieu and ambience, organized around, and embodied in, three constituents. The first is the established means of paper sessions, with formal presentations and subsequent publication of papers modified by the authors following the conference in a "Proceedings." Papers for presentation in this manner will be refereed by the program committee and, where necessary, others, on the basis of abstracts *received by October 14, 1988,* and/or full papers *presented by February 10, 1989.* The second is a less well-established though frequently used approach, for which interesting additional technology now exists. There will be discussion sessions, each to be led by an invited, distinguished academic, contributing introductory papers on the conference theme. The papers will be distributed to participants before the conference. Each event will be recorded verbatim, and transcripts will be made available, together with computer editing facilities. Revised transcripts will form the basis for a "Second Proceedings." Third, there will be a social milieu in which participants may relax, discuss, meet informally, enjoy life, dispute, and generally interact.

This conference is organized and chaired jointly by Dr. Ranulph Glanville (Portsmouth Polytechnic and University of Amsterdam) and Prof. Gerard de Zeeuw (University of Amsterdam). Requests for further information and other questions should be directed to the conference coordinator, Ms. Joop Muller, Programma Ondersteuning, Overleving en Cultur, Grote Bickersstraat 72, 1013 KS Amsterdam, THE NETHERLANDS, phone [31]-(0)20-525-1250.

8th International Congress of Cybernetics and Systems

The 1990 Congress will be held June 11-15, at Hunter College, City University of New York, and will provide a forum for the presentation and discussion of current research. Several specialized sections will focus on computer science, artificial intelligence, cognitive science, biological cybernetics, psychocybernetics, and sociocybernetics. Suggestions for other relevant topics are welcome.

All correspondence regarding the Congress should be addressed to Prof. Constantin V. Negoita, Dept. of Computer Science, Hunter College, City University of New York, 695 Park Ave., New York, NY 10021.

Announcements from the IST

1. Three-Step Training Program in Second-Order Systemic Therapy.

This Program will begin next spring, with "Basic," "Advanced," and "Master" Courses. The Faculty includes Harlene Anderson, Tom Andersen, Luigi Boscolo, Gianfranco Cecchin, Harold A. Goolishian, Lynn Hoffman, Bradford P. Keeney, Eve Lipchik, Peggy Penn, and Karl Tomm.

2. "Co-Menting—Towards a Systemic Poietology"

This conference will be held in Bremen, FEDERAL REPUBLIC OF GERMANY, November 4-5, 1988, with the participation of Tom Andersen, Harold A. Goolishian, Bradford P. Keeney, and Klaus G. Deissler.

For further information on the above, contact the Institut fin. Systemische Therapiestudien, Friedrich-Naumann-Str. 9, 3550 Marburg, FEDERAL REPUBLIC OF GERMANY.

3. *Recursive Creation of Information: Circular Questioning as Information Generation.*

This 91-page book by Klaus G. Deissler is available for $16.00 (drawn on a West German bank) from InFaM-Verlag, Friedrich-Naumann-Str. 9, 3550 Marburg, FEDERAL REPUBLIC OF GERMANY.

IF YOUR ADDRESS IS CIRCLED IN RED, PLEASE RENEW IMMEDIATELY. NO SEPARATE RENEWAL NOTICE WILL BE SENT!

The Cybernetic Basis of Human Behavior and Performance

By Thomas J. Smith   Supervisor, Human Factors Research, U.S. Bureau of Mines, Twin Cities Research Center, 5629 Minnehaha Ave. South, Minneapolis, MN 55417

and Karl U. Smith   Professor Emeritus, University of Wisconsin Behavioral Cybernetics Laboratory, 1001 Tower Blvd., Lake Wales, FL 33853

Overview

In response to an invitation by Greg Williams, we have prepared this special issue of *Continuing the Conversation* devoted to behavioral cybernetics. The science of behavioral cybernetics is concerned with experimental and theoretical analysis of human behavior as a self-governed, closed-loop control process. Research in the field generally deals with the role of motor systems of the body in controlling: (1) the body's energy budget, which in turn mediates behavioral-physiological integration; (2) sensory stimulation, which in turn mediates motor control of perception and cognition; (3) interpersonal interaction and communication, which defines the social, occupational, educational, and cultural fabric of our society; and (4) the external environment, which has driven the technological, architectural, and evolutionary development and achievements of our species. Typically, many or all of these behavioral control processes operate in integrated synchrony through a hierarchy of feedback and feedforward control mechanisms in the performance of particular tasks and operations. Our general thesis is that human behavior, in all of its modes and manifestations, is cybernetically organized like all other known biological processes, and that scientific understanding of all phenomena involving the human organism, from learning to work to evolution itself, must begin with fundamental recognition of the inherently cybernetic nature of human behavior and performance and the human condition. For purposes of brevity, we use the terms cybernetic or feedback control throughout the report to refer to the general phenomenon of closed-loop control, which may in fact involve positive or negative feedback or feedforward control mechanisms.

In this special issue we summarize a large body of theoretical and experimental work extending over the past three decades dealing with conceptual development and experimental validation of behavioral cybernetic science. The next two sections outline the theoretical foundations of the field, and provide supporting experimental evidence. We then summarize the scientific contributions of behavioral cybernetics with a series of sections dealing with feedback concepts of behavior, learning, and cognition, computer methods of feedback research, feedback control of vision and speech, behavioral-physiological integration, developmental cybernetics, social cybernetics, human-computer interaction, and evolution cybernetics.

The guiding force in the development and elaboration of the field of behavioral cybernetics is the senior author of this report, Karl U. Smith. As described in a recent issue of the *Human Factors Society Bulletin* (Smith, 1987), his World War II and postwar research on human-machine performance establishes him as one of the founders of human factors science in the United States. He also played a seminal role in helping to establish the International Ergonomics Association in the fifties (Smith, 1988). His wartime observations, on the devastating effects on operator tracking performance of temporal delays and spatial perturbations in sensory feedback produced by new, semiautomated military hardware, provided conceptual inspiration for subsequent study of behavioral feedback control (Smith, 1962). At the University of Wisconsin - Madison, he started the first postwar nonmilitary human factors research program, which led in 1960 to the establishment of the Behavioral Cybernetics Laboratory.

The concepts and results discussed in this report are based on a large body of behavioral cybernetic research literature, which is grouped separately from other citations in the References. This work represents the collective effort of over forty students who have received their doctoral or masters degrees under K.U. Smith, plus collaboration with his wife (Margaret F. Smith), his son (Thomas J. Smith), and his brother (William M. Smith, Professor of Psychology at Dartmouth). Important compilations of the work include books on cybernetic principles of growth and development (Smith, 1987), social behavior (Smith, 1974a), general psychology (K.U. Smith and M.F. Smith, 1973; K.U. Smith and W.M. Smith, 1958), learning and educational design (K.U. Smith and M.F. Smith, 1966; K.U. Smith and T.J. Smith, 1968), work science (Smith, 1965), space-structured behavior (K.U. Smith and W.M. Smith, 1962), and delayed sensory feedback (Smith, 1962), plus 16 major reviews dating back to 1961 (Smith, 1973, 1972a, 1967, 1966a, 1964, 1963a, 1963b, 1962b, 1961a, 1961b; Smith and Henry, 1967; K.U. Smith and T.J. Smith, 1970; T.J. Smith and K.U. Smith, 1988a, 1987a, 1985; Smith and Sussman, 1969).

Introduction

The field of behavioral cybernetics originated immediately after World War II in a research program concerned with human factors design of work and performance. This program, the only human factors research program of the period that was not supported by the military (Bonjer, 1956; Singleton, 1956), was centered on formulating and applying feedback concepts to research on all aspects of work performance. The concepts were believed to found a new theoretical approach to psychology based on human-factors principles, and were viewed as being opposed to the dogmas of stimulus-response and environmental determination of behavior, as applied especially in the emerging area of engineering psychology (Fitts, 1951). When plans for a new research laboratory independent of the Psychology Department at the University of Wisconsin-Madison were drawn up in the late 1950s, the term "behavioral cybernetics" was adopted to designate its research focus.

The field of behavioral cybernetics was conceived and developed with four objectives: (1) to apply innovative real-time computer methods to the study of feedback control characteristics of human behavior; (2) to establish an experimental program of behavioral research on human-computer interactions, based on use of a real-time computerized laboratory to explore interactive performance; (3) to define a feedback-control theory of human behavior aligned with emerging experimental evidence that biological functions and systems at all levels of organization are feedback controlled and integrated; and (4) to apply concepts and findings obtained under objectives 1-3 as a general paradigm for analyzing the behavioral cybernetic properties of human performance, encompassing such areas as education and training, learning and cognition, human factors design of human-machine systems, social interaction, growth and development, work design and organization, rehabilitation, health and safety management, and human evolution.

The objectives just defined have been achieved fully. Collectively, the research results obtained have helped to substantially define the broad field of behavioral feedback research. The theoretical concepts developed constitute a modernization of the theory and experimental methods of behavior science to conform with the now established feedback and systems concepts of biology (Adolph, 1982), and with the requirements for objective experimental understanding of behavior in relation to automated human-computer systems and the computer age (T.J. Smith and K.U. Smith, 1988a, 1988b, 1987b). As the field has developed over the past three decades, computer-based experimental research conducted at the Behavioral Cybernetics Laboratory has served as a critical source of objective human factors and human performance data concerning computer-mediated behavior and human-computer interactions (T.J. Smith and K.U. Smith, 1988a, 1987a). This research also has served as a framework for formulating the first systematic feedback control principles of learning and educational design (K.U. Smith and M.F. Smith, 1966), rehabilitation (Smith and Henry, 1967), exercise and athletic skill (K.U. Smith and T.J. Smith, 1970), hazard control and management (Painter and Smith, 1986; Smith, 1979; T.J. Smith, Lockhart, and Smith, 1983; T.J. Smith and K.U. Smith, 1983), and social interaction and communication (Smith, 1974a; Sauter and Smith, 1971).

Theory and Concepts

In the past four decades, the cybernetic basis of internal organization and function has been firmly established at all hierarchical levels—i.e., molecular, cellular, physiological, tissue, organic, and developmental (Adolph, 1982). Behavioral cybernetics has been concerned with extending these findings to behavior, and has succeeded in producing extensive experimental evidence that behavior is both controlled and integrated on a feedback

basis. We conclude that the motor system, through a series of well-characterized feedback control mechanisms, organizes and integrates all manifestations of both behavioral and physiological function. A broader statement of this viewpoint is that action, behavior, and biological function and structure generally are integrated through these closed-loop control mechanisms, and that life itself is defined in terms of this integration. The field of behavioral cybernetics rests upon the following basic concepts.

Self-Regulation. Behavioral cybernetics is devoted to understanding and studying the self-regulatory properties of human and animal behavior and function. The basic concept is that the living and behaving organism represents a unified, self-controlled feedback system at all hierarchical levels of organization and development—the germ cell, embryo, fetus, infant, child, adolescent, adult, older person, and the disabled individual. This means that the principles of stimulus or environmental determination of behavior, the hallmarks of orthodox psychology and behavior science, are discarded in behavior cybernetics in favor of the principles of self-regulation and self-integration of behavior. In the behavioral cybernetic approach, human development represents a process of expanding and refining self-regulation over the environment and over internal vital functioning, as well as over adaptive behavior (Smith, 1987; Schiamberg and Smith, 1982).

Behavioral-Physiological Integration. External behavioral and internal physiological processes are feedback integrated continuously to control the efficiency of energy metabolism in the body. This integration of molecular, cellular, physiological, organic, and neural mechanisms with motor activity is mediated by different patterns of cooperative interaction of the somatic musculature, such as reciprocal innervation of paired agonistic and antagonistic muscles, bilateral interaction, interaction of postural, transport and manipulative movements, and motor-receptor interactions. Because they involve the relative stretch and shortening of critically active muscles in different task-specific motor skills, these patterns of motor coordination and interaction determine the efficiency of energy regulation in human performance. Additionally, because the rate and pattern of energy metabolism in somatic muscle cells is feedback linked with the control of oxygen transport as well as carbohydrate, fat, and protein metabolism, and related neurohormonal mechanisms, by the cardiorespiratory, gastrointestinal, hepatic, renal, endocrine, and central nervous systems, motor system function also feedback regulates organic metabolism and visceral integration. The *homeokinetic principle* (K.U. Smith and M.F. Smith, 1966, p. 471) assumes that control of behavioral-physiological integration at all levels is an active, motor-based process.

Feedback Principles of Movement Integration. As noted above, movements and behavioral-physiological interactions are both controlled and integrated on a feedback basis. The behavioral mechanisms involve body-movement tracking and steering. One movement mechanism generates a sensory and/or neural signal that is detected by the receptor/afferent-neural processes of a second movement mechanism, which controls this input as feedback, and generates a compliant sensory/neural signal which can be detected by the first movement mechanism and its receptor/afferent-neural detectors. These reciprocal body movement tracking mechanisms, and their role in governing the efficiency of energy metabolism and vital integration in performance and development, define the effectiveness of organization and adaptation by the organism.

Feedback Control of the Environment. The behavioral environment is a human-factored universe of situations, objects, stimuli, and people, which has evolved gradually in an evolutionary feedback process along with the make-up of man and his behavior. The individual is both a product of and a contributor to the continued evolution of the man-made envi-

ronment and the human condition. This feedback interaction occurs at all levels of action and development—motor, perceptual, cognitive, motivational, and physiological—and mediates all of the influences which the environment and the genes in gene expression have upon development and behavioral adaptation. In specific terms, we actively and continuously control all modes and patterns of environmental stimulation, and thereby control perception. We actively and continuously control all aspects of the internal environment, such as body temperature, pH, electrolyte levels, composition and distribution of intracellular and extracellular fluids, and so forth. Through motor behavior, we actively and continuously control our interaction with other individuals and with environmental objects and conditions. As a product of such control, through creation of communication, architectural, transport, energy, clothing, and other technologies, we actively and continuously control the forces of nature as they affect us. With the obvious exception of technology, these same statements apply generally to all living organisms. Both phylogenetic and ontogenetic differentiation reflect diversity and gradation in environmental control mechanisms and competency. In behavioral cybernetic terms, life itself is based upon feedback control of the environment. When such control is compromised, life is threatened and ultimately ceases.

Motor Control of Sensation and Perception. A central tenet of behavioral cybernetics is the action theory of perception—that perception is an active, dynamic process involving integration between different receptor movement mechanisms and between receptor movement mechanisms and body movements. Like other modes of dynamic behavior, sensation and perception are active motor behavioral processes, not simply receptor/neural mechanisms produced by external stimulation. This view holds that perception is based on an integrated series of self-regulated, motor coordinate mechanisms which feedback control receptor processes, environmental stimulation, and consequent perceptual activity in the central nervous system. Distinctive types and patterns of movement integration among receptor motor mechanisms, and between receptor motor operations and body movements, mediate control of the retinal image, the auditory cochlear receptors, the various skin receptors, and the proprioceptive/kinesthetic receptors. Some of these motor-sensory and motor-perceptual integrative processes, particularly those which interrelate eye movements, head movements, and postural, travel, and manipulative movements, are among the most refined motor coordinate mechanisms of the body.

The action theory of perception is illustrated in Figure 1, which indicates that postural, travel, and articulatory movements are used to mediate control of five major attributes of stimulation and receptor activity, namely: (1) sources of stimulation; (2) modulation of the physical properties of environmental stimuli; (3) self-stimulation of receptors by movement; (4) orientation and interaction of receptors; and (5) receptor sensitivity and transmission of afferent traffic. The term *sensory feedback control* encompasses all of these mechanisms. The figure also indicates that the neurogeometric organization of association detector neurons in the brain forms the basis of spatiotemporal guidance of motor behavior, as well as learning and memory (below), through integrative mechanisms which compare patterns of neuronal activation arising from self-stimulation with those generated by environmental stimulation. The critical conclusion from this analysis is that cognition is a motor coordinate process defined by the motor control mech-mechanisms specified in the figure.

The Human Factors Foundation of Behavior. All aspects of the human environment, including social and cultural organizations of people, are human factored—i.e., structured and dynamically operated to conform to some degree to the general properties of human behavior, human anatomy, and human physiological
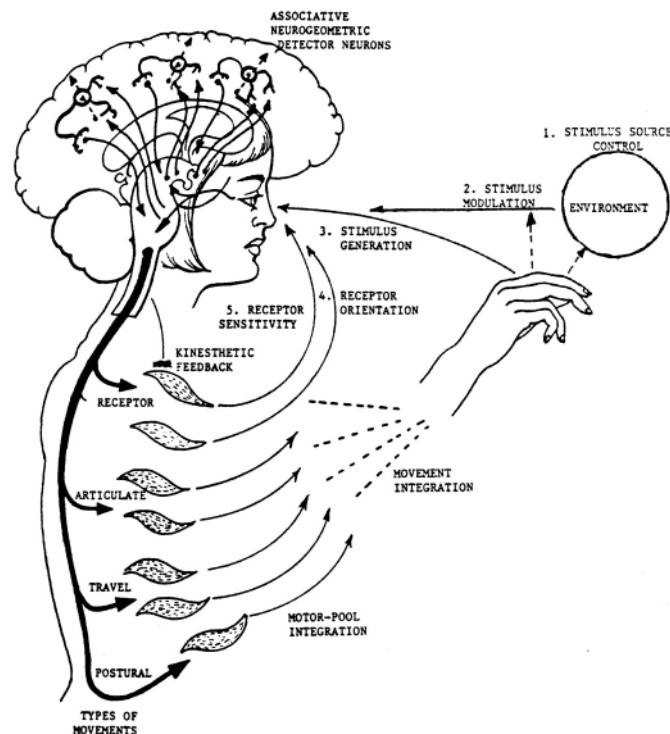

Figure 1. Modes of sensory feedback control by motor behavior.

function. The human factors principle, not direct stimulus determination of behavior, is the critical doctrine and theme of the behavioral cybernetic approach to behavior science. It applies broadly to the interactions between human behavior and the environmental systems of culture, to limited environmental situations and properties of group performance, and to individual feedback relationships with specific environmental situations, objects, and stimuli. All stages of human life-span development and change are human factored in relation to the structure and dynamics of the behavioral environment. The principles of ergonomics (behavioral-physiological efficiency in work, exercise, and activity) are defined by the human-factored interrelationships between motorsensory activity in control of the energy budget of the body and the man-made environment.

Cybernetic Theory of Learning and Memory. The behavioral cybernetic interpretation is that learning and memory are feedback controlled at both environmental and physiological levels, and that learning occurs as a consequence of behavioral control of sensory feedback generated by environmental stimulation. The *neurogeometric hypothesis* (T.J. Smith and K.U. Smith, 1987a; K.U. Smith and W.M. Smith, 1962) assumes that ensembles of detector neurons in the central nervous system are organized cytoarchitectonically, not only in relation to the anatomical arrangement of body effectors and receptors (somatotopic organization), but also in terms of the spatial geometry of movement. These neurons are specialized for discriminating the spatial and temporal qualities of sensory feedback, in relation to intra-and inter-receptor activation patterns arising from both self- and environmentally-generated stimulation. Motor behavior, which actuates detector neurons through dynamic sensory feedback effects of integrated patterns of motor activity, represents the behavioral feedback determinant of learning and memory. The concurrent physi-

ological feedback effects of motor activity—involving organic, metabolic, neurohormonal, interoceptive, and proprioceptive mechanisms—on brain detector systems represent the physiological feedback determinants of learning and memory. Both behavioral and physiological feedback influences modulate the detector characteristics of ensembles of central neurons in detecting incoming sensory and physiological effects of motor-sensory activity, and in controlling effector integration and output to mediate control of such activity. As a result of this modulation, there is closer spatial and temporal conformity between self-generated (due to self-stimulation from motor activity) and environmentally-generated (due to environmental stimulation) detector neuron activation patterns. Consequently, the fidelity of both behavioral and physiological tracking (i.e., control) of environmental sensory feedback improves, a refinement that becomes behaviorally manifest as skill development and learning. Presumably, short- and long-term memory are distinguished in terms of the location and identity of neuronal ensembles that are actuated during this associative process; current information suggests that long-term memory is critically dependent upon neuronal activation in subcortical brain regions and the cerebellum.

Learning and memory represent an integral aspect of central nervous system maturation and gene expression in fetal and infant development, childhood, adolescence, and adulthood. As critical periods of brain and behavioral maturation and gene expression emerge, learning modulates developmental changes in relation to particular human-factored aspects of the environment, and also in relation to particular patterns of physiological integration and energy regulation of the body. Learning and memory are thus specialized and individualized in terms of how the developing individual controls his/her particular physiological characteristics and distinctive environmental conditions and relationships. As development proceeds, learning of specific movements and perceptions is achieved so that the specific components are incorporated within larger integrated organizations of motor, perceptual, and cognitive behavior, typically on a situational basis.

Social Feedback Principles. Social behavior is manifest as interpersonal and group activity and as human-factored institutional organization of the behavioral environment. Social organization and performance, like individual performance, have evolved gradually to define both biosocial and biocultural (environmentally patterned and human-factored) aspects of behavior. This evolution, like that of behavior and technology, has proceeded predominantly on an ergonomic basis in relation to both the management organization and technology of work. Social behaviors are feedback controlled and feedback integrated as social tracking and steering processes. The movements of one individual generate sensory inputs to a second who, in controlling these inputs as feedback, generates compliant signals back to the first person, and so on. Social tracking thus extends the patterns of integrated coordinate sensory feedback control characteristic of individual behavior. Accordingly, the parameters, modes, and conditions of social integration of individual behavior constitute a wide range of specialized interactions which can be diversified even further by specialized ages, genders, development, and instrumental and environmental skills of people. Communication represents a diversified pattern of feedback-controlled interactive tracking and steering among persons at both interpersonal and group levels. Human-factored standardization of communication forms and media define the technology of communicative and of social behavior generally, constituting the foundations and specialization of culture as well as the foundations and specialization of both non-verbal and verbal/symbolic cognitive operations.

Feedback Control of Natural Selection and Evolution. All of the modes and levels of behavioral feedback control outlined above have enabled humans to feedback control their own natural selection, and thereby the pace, direction, and progression of their own evolution. The major themes of human evolution over the past two million years have been expansion and refinement of: motor-sensory, cognitive, and communicative skills; human-factored control of tools and machines, technology, and the human environment; organizational development of social, societal, and cultural groups, communities, and institutions; and progressive technological integration of human society worldwide through commerce, communication, and automation technologies. Our cybernetic theory of evolution assumes that all of these themes have been defined and guided in a self-selective manner through human behavioral feedback control of motor-sensory and physiological integration, cognition, the physical and the human-factored environment, and social interaction and communication. In a broader sense, we assume that biological evolution generally is a cybernetic process, in which organisms guide their own genotypic and phenotypic variability as a function of differential competency in feedback control of the environment, and thereby determine their own self-selection in evolution.

Experimental Methods of Behavioral Cybernetics

In addition to providing the principal theoretical formulation of a control theory of behavior based on feedback principles, the field of behavioral cybernetics also has originated major advances in experimental behavioral research methods and design. These include the application of new electronic methods of motion study and analysis (Smith, 1957), laboratory television methods (K.U. Smith and W.M. Smith, 1963, 1962), real-time computerized laboratory methods (Smith and Arndt, 1969; K.U. Smith and T.J. Smith, 1970; T.J. Smith and K.U. Smith, 1988a, 1987a), and techniques of real-time computer experimental design to the study of all major aspects of behavior. The technical impetus for these applications was the need to study the dynamic properties of behavioral control in real time. However, a more fundamental guiding idea behind the developments was to adapt experimental techniques in behavior science and psychology to emerging television, electronic communication, and computer technologies, and their interactions with human behavior, cognition, and society. The most significant contribution of behavioral cybernetics may turn out to be that it represents the theoretical and objective experimental accommodation of behavior science and psychology to the global societal revolution in computerized automation and television communication.

The initial experimental effort was directed toward exploring the human factors involved in televised behavior. A human-television interactive behavioral laboratory was organized, and over a period of a few years carried out numerous experiments concerning televised displaced vision, delayed visual feedback in behavior, television-mediated behavior in children, infant control of the televised perceptual environment, social tracking and interaction via television, feedback analysis of televised tool-using, computer-controlled responsive televised display systems, and analysis of developmental visual behavior via television (Smith, 1964, 1963a, 1962a, 1961a, 1961b; K.U. Smith and T.J. Smith, 1969; K.U. Smith and W.M. Smith 1963, 1962). The research constituted the backbone of extending human factors and system behavioral research designs to development, education, and rehabilitation (K.U. Smith and M.F. Smith, 1966). An award was obtained from the television advertising industry for initiating behavioral research on televised behavior (K.U. Smith and W.M. Smith, 1963). The research represented the formation of an objective experimental science of television communication.

As TV-based study of the feedback properties of behavior proceeded, it became evident that real-time, computerized

methods of experimentation constitute the only feasible techniques for conducting advanced research on the interactive and integrative aspects of behavior. Accordingly, in 1960, a computerized laboratory was designed and established for systematic research on all aspects of computer-mediated and computer-controlled behavior (K.U. Smith and T.J. Smith, 1970; Smith and Arndt, 1969; Smith, Ansell, Koehler, and Servos, 1964; Smith, Mysziewski, Mergen, and Koehler, 1963). The computerized laboratory facility consisted of a central, real-time, analog-digital-analog computer system surrounded by some twenty different experimental modules, each devoted at different times to experiments on specific aspects of computer-mediated and computer-controlled behavior and perception. Experimental design and control programs were devised and used for different series of controlled experiments on vision, hearing and speech mechanisms, movement integration, behavioral-physiological integration, cognitive operations, social-tracking interactions, and machine behavior.

Figure 2 illustrates the major types of computer-mediated experiments which were conducted. Findings from the re-
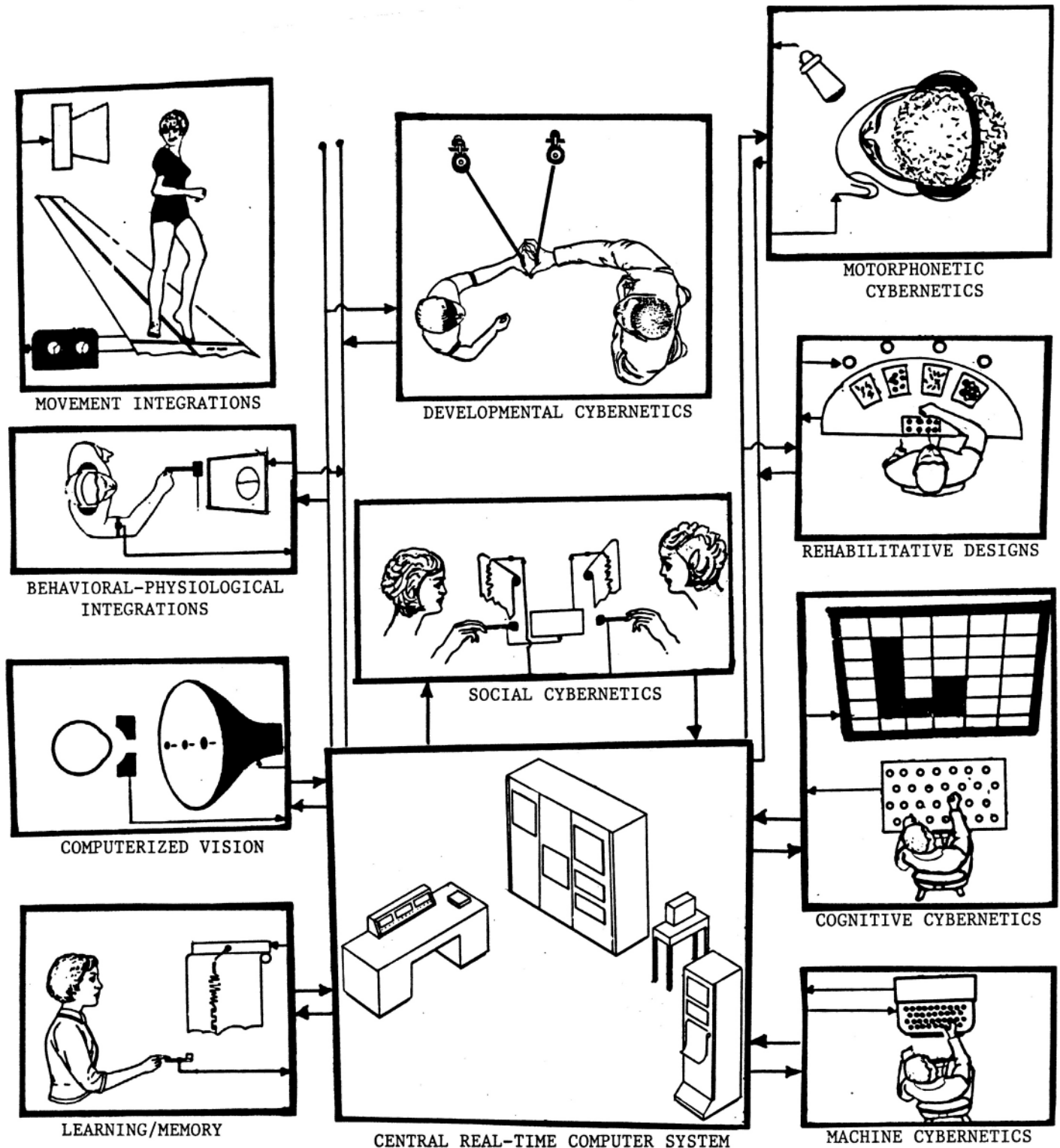
Figure 2. Experimental concerns of the computer-based behavioral cybernetics laboratory..

search areas depicted in the figure indicate clearly that real-time computerized methods represent an indispensable tool for measurement of the dynamic properties of the interactive movements mediating behavioral control, as in synchronized activities, bilateral interactions, lateralized relationships in performance, interactions of posture, transport and manipulative movements, breathing-body movement interactions, coordination of eye movements and body movements, social interactions, machine steering functions, and precision control of space-displaced, delayed, and modified motor-sensory feedback relationships in perception, motor performance, learning, and memory.

The advantage of this methodological approach is that it enables analysis of the interactive changes in each of two or more dependent variables, such as eye and hand movements, involving real-time computation of relative spatiotemporal similarities or differences between the two activities. From this analysis, it is possible to give a subject a real-time sensory feedback display which indicates the way the two movements are coordinated, and to study subject performance on a specified task (for example, hand tracking of eye movements or vice versa, or eye-hand tracking of an external target) in relation to the spatiotemporal properties of the sensory feedback. The same general conceptual approach and experimental design can be applied broadly to analysis of social behavioral, machine, and behavioral-physiological interactions.

This use of computerized methods was extended beyond data acquisition and data analysis to completely automate every phase of controlled experimental observation of human behavioral performance. Specifically, by means of real-time programming techniques, the computer system was configured to generate instructions to the subject, carry out calibration measurements relating dependent and independent (motor and sensory) variables, schedule trials, control trial duration and order of feedback conditions within trials, generate variations in independent variables, make split-second measures of response and other dependent variables, calculate derivative measures of dependent variables, store and statistically analyze response measures, and generate output reports for an experimental session (Smith and Arndt, 1969).

Experimental Evidence for a Feedback Theory of Behavior

In all of the experimental situations illustrated in Figure 2, the central real-time computer system was used to mediate and control the dynamic sensory feedback properties of the behavior being investigated. In this manner, feedback relationships between variability in behavioral performance and learning, and variability in sensory feedback, could be studied. The underlying assumption with this approach is that self-regulated guidance of behavior depends upon continuous motor control of sensory feedback, and that the fidelity of behavioral control therefore is directly and continuously influenced by the dynamic spatial and temporal qualities of sensory feedback which must be controlled.

The experimental paradigm which guided study design is described by the term *perturbed sensory feedback experiment.* As indicated in Figure 2, a specific behavioral performance task first was selected for study—examples shown in the Figure include visual-manual tracking, eye-movement tracking, movement tracking of a physiological signal, postural tracking, social tracking, speech, and keyboard entry. The computer was used to control the feedback display to the subject, by digitizing the analog signal from the tracking target, modifying this signal through transformation of its spatial and/or temporal qualities, and then presenting the transformed signal as a sensory feedback display to the subject. Spatial perturbations

studied in this manner include inversions, reversals, and/or angular displacements of visual feedback. Temporal perturbations studied involve delayed or intermittent presentation of the sensory feedback display. Performance effects of various combinations of these sensory feedback perturbations also were evaluated. Once a particular perturbation condition had been introduced under computer control, the computer also was used to monitor the fidelity with which the subject executed the performance task. The general conclusion from an extensive body of research conducted using this approach is that the performance of every behavioral task so far examined is degraded by perturbations in sensory feedback.

Table 1 documents this conclusion in more detail with a condensed summary of results from studies of many different types of behavioral performance under perturbed sensory feedback conditions, based on either computer-based (Figure 2) or television-based methodology. The Table lists the type of performance decrement observed for 19 different types of behavioral tasks, as a result of imposition of spatial and/or temporal perturbations in sensory feedback. These tasks span a broad spectrum of cognitive, psychomotor, social, and behavioral-physiological behaviors, including writing, graphic drawing, speech, and musical activities which are widely held to represent the fullest expression of human cognitive skill and proficiency.

There are a number of general features of behavioral disturbance evoked by sensory feedback perturbations which appear consistently from study to study. Oscillatory instability in movement control becomes more pronounced, accompanied by increased variability and extremes in movement velocities and accelerations. As a consequence, the accuracy of movement guidance and tracking accuracy suffers. Perception is degraded and may disappear altogether; learning concomitantly is impaired. When asked, subjects report feeling confused, uncomfortable, or uncertain about their own behavior. Skilled performers are particularly sensitive to these effects. A group of talented graphic artists, asked to execute a drawing under conditions of size distortion of visual feedback, displayed a distinct lack of motivation for continuing after a few sessions (K.U. Smith & W.M. Smith, 1962, Chap. 11). A skilled musical quartet, asked to perform under delayed auditory feedback conditions (Ansell and Smith, 1966), absolutely refused to continue the task after a few minutes, claiming that further exposure to the perturbation would irreparably damage their performance skill. The experience of the senior author of this report suggests that these concerns may have been warranted. In the course of serving as a subject in a series of delayed auditory feedback experiments dealing with speech control over a period of weeks, he noted the appearance of stuttering and speech irregularity problems that persisted for months after the experiments themselves had been terminated.

Three general conclusions can be drawn from these observations. First, no behavioral activity or process so far examined is immune from the adverse effects of perturbations in sensory feedback. This conclusion applies to the performance as well as the learning of the behavior. Secondly, the learning curves for task performance under perturbed sensory feedback conditions show training effects over time, but control levels of performance are not achieved even after training periods lasting as long as 20 days (K.U. Smith and W.M. Smith, 1962; see also Welch, Chap. 13, pp. 275-279). Finally, results from the different studies indicate that the particular effects of a given perturbation condition are task-specific, dependent upon the spatiotemporal characteristics and integrative properties of the motor control patterns involved.

The inference we draw from these observations is straightforward: behavior is guided continuously as a dynamic, feedback-controlled process. As discussed further in the next section, these effects are not predicted by traditional theories of behavior,

which assume that behavioral responses are controlled either by the environment (S-R, reinforcement, and operant conditioning theories) or by some internal mechanism (information processing theory).

Scientific Contributions of Behavioral Cybernetics: A Perspective

The purpose of this section is to outline what we believe constitute the major theoretical and experimental scientific contributions of behavioral cybernetics. As part of this analysis, we briefly address other scientific points of view to provide an historical perspective.

Feedback Control of Behavior

The most important scientific contribution of behavioral cybernetics is in developing a comprehensive theoretical framework and supporting experimental evidence for the viewpoint that behavior is a feedback controlled process. Scientific appreciation of the fact that living systems have the ability to self-regulate their own activities dates back over 100 years. Both Pfluger (1875) and Fredericq (1887) called attention to the fact that when confronted with a need or disturbance, living organisms have the ability to actuate responses which address the need or disturbance. These early thoughts regarding biological self-regulation were based on the seminal work of Bernard (1865), who emphasized that life itself depends upon vital mechanisms which maintain the relative constancy of the internal environment, the *milieu interieur.* Earlier in this century, Bernard's theme was expanded upon by Cannon (1932), who coined the term "homeostasis" to describe the coordinated repertoire of physiological mechanisms which the body applies to maintain a relative balance of internal states and conditions. In the ensuing decades, a massive amount of experimental evidence has been compiled to indicate that closed-loop self-regulation, based on positive and negative feedback and feedforward control mechanisms, is a ubiquitous feature of physiological, cellular, and molecular activity. Adolph (1982) summarizes evidence in support of the general conclusion that living organisms rely upon a hierarchy of closed-loop feedback control mechanisms to self-govern all modes and levels of internal organization, structure, and function.

As the science of modern psychology emerged about a century ago, some of the founders of the field endorsed the concept of self-control of behavior in their thinking and writing. Cybernetic psychology—based on the view of behavior and cognition as motor-based feedback controlled processes—has its origins in early motor theories of perception and thinking. James (1894, 1890) was one of the first advocates of this view, with his motor theory of the determination of emotional experience. Munsterberg (1889), the founder of the field of applied psychology, was one of the first strong critics of the doctrine of the substantive mind, and an early advocate of the view that motor processes mediate complex behaviors, including thought. His graduate student at Harvard, Stetson (1951), developed a motorphonetic theory of speech, language, and cognitive linguistic skills as motor-controlled processes,

Table 1. Summary of Results from Perturbed Sensory Feedback Research in Behavioral Cybernetics Laboratory

Task	Perturbed Sensory Feedback Condition	Performance Decrement	Reference
Handwriting	Inversion; Reversal; Inversion-Reversal; Angular Displacement; Feedback Delay	Contact and Travel Times; Accuracy; Learning	1,2,3,6,7, 24
Symbolic Drawing	Inversion; Reversal; Inversion-Reversal; Angular Displacement; Feedback Delay	Contact and Travel Times; Accuracy; Learning	1,2,3,6
Target Tapping	Inversion; Reversal; Inversion-Reversal; Angular Displacement; Feedback Delay	Contact and Travel Times; Learning	1,2,4
Maze/Star Tracing	Inversion; Reversal; Inversion-Reversal; Angular Displacement; Feedback Delay	Accuracy; Learning	1,2,4,5
Pin-Assembly	Inversion; Reversal; Inversion-Reversal; Angular Displacement; Feedback Delay	Movement Duration; Learning	1,2,4
Graphic Drawing	Size Distortion	Accuracy; Learning	1
Reading	Inversion; Reversal; Inversion-Reversal; Angular Displacement	Reading Times and Errors	8
Speech	Feedback Delay	Stuttering; Slowing and Errors of Speech; Long-Term Speech Disturbances	9
Musical Performance	Feedback Delay	Performance Time	10
Jaw Movements During Speech	Feedback Delay	Duration of Jaw Activity	11
Postural Tracking of a Visual Target	Inversion; Reversal; Inversion-Reversal	Tracking Accuracy	12
Steering Performance in a Driving Task	Angular Displacement; Feedback Delay	Steering Accuracy	13,23
Retinal Projection of an Eye-Movement-Controlled Visual Image	Reversal	Skittered Vision; Severely Impaired Vision; Pain and Discomfort	14,15,16, 17
Eye-Movement Tracking of a Visual Target	Reversal; Feedback Delay	Tracking Accuracy; Learning	18,19
Memory of a Visual Image	Feedback Delay; Feedback Intermittency	Memory Error	20
Breath Pressure Tracking of a Visual Image	Feedback Delay	Tracking Accuracy; Learning	
Head Movement Tracking of a Visual Image	Reversal; Angular Displacement; Feedback Delay	Tracking Accuracy; Learning	21
Electromyographic Tracking of a Visual Image	Feedback Delay	Tracking Accuracy; Learning	22
Social Tracking	Provision of Visual Feedback; Division of Feedback Control	Tracking Accuracy; Learning	25,26,27

References: 1. K.U. Smith & W.M. Smith, 1962; 2. Smith, 1962a; 3. McDermid& Smith, 1964; 4. Smith, Wargo, & Jones, 1963; 5. Gould & Smith, 1963;6. Smith & Greene, 1963; 7. Smith & Murphy, 1963;8. Smith, Cambria, & Steffan, 1964; 9. Smith, Mysziewski, Mergen, & Koehler, 1963; 10. Ansell and Smith, 1966; 11. Sussman & Smith, 1971; 12. Smith & Arndt, 1970; 13. Smith, Kao,& Kaplan, 1970; 14. Smith & Molitor, 1969; 15. Smith, Putz, & Molitor, 1969; 16. Smith, 1970; 17. Smith & Putz, 1970; 18. Smith & Sussman, 1969; 19. Sussman& Smith, 1969; 20. Henry, Junas, & Smith, 1967; 21. Smith & Raman, 1969; 22. Rubow & Smith, 1971; 23. Kao & Smith, 1969; 24. Smith & Schappe, 1970; 25. Sauter & Smith, 1971; 26. Smith & Kao, 1971; 27. Ting, Smith, & Smith, 1972.

and provided extensive experimental evidence in support of this view. The first feedback interpretation of the reflex circle was given by Dewey (1896), who observed that behavioral responses to stimuli have a reciprocal effect of altering the stimuli that induce them. Delabarre (1898, 1891), the first to record eye movements, developed a comprehensive theory of the motor-kinesthetic basis of all mental processes, including thought. The senior author of this report was a graduate student of Delabarre, and extends his views.

Unlike the fields of physiological and cellular biology however, modern psychology abandoned its early cybernetic focus in favor of open-loop theories of behavior and learning which have dominated the field throughout this century. These theories generally have adhered to two basic themes, namely the dogmas of Darwinism and mentalism. Darwinian theories assume that behavior and learning are environmentally determined. Because they all assume that behavioral responses are controlled by environmental stimulation, reinforcement (Thorndike, 1932, 1927), contiguity or S-R (Guthrie, 1952), conditioning (Hull, 1943; Pavlov, 1927), and operant conditioning (Skinner, 1953, 1938) theories all fall within the Darwinian framework. The ultimate statement of behavioral Darwinism is that of Skinner (1971), with his claim that all human behavior is environmentally determined.

In tagging these traditional behavior and learning theories with a Darwinian label, we do not mean to imply that they are void of any feedback connotations. In fact, knowledge-of-results (K-R) feedback is assumed as a key influence on behavioral response and learning efficiency in all of these theories. However, K-R feedback represents only one limited mode of feedback control involved in behavior, a mode which certainly cannot account for the dynamic guidance of behavioral expression and learning mediated by continuous motor control of sensory feedback (K.U. Smith and M.F. Smith, 1966). K-R doctrine also explicitly adopts the open-loop, Darwinian interpretation that environmental stimuli determine and thereby control the response. In traditional psychology, preoccupation with this interpretation is so pervasive that the term feedback is defined in *Psychological Abstracts* under knowledge-of-results and reinforcement *(ibid.,* p. 204).

The mentalistic doctrine of the substantive mind represents the second major theoretical theme that has dominated modern psychological thought. Although this view has ancient origins, it has been reincarnated in the course of the emergence of modern cognitive science with the computer-metaphor model of the brain as an information processor (Baars, 1986; Kessan and Cahan, 1986). The computer-metaphor model of brain functioning has its origins in the application of information theory to human communication (Licklider and Miller, 1951; Shannon, 1948), and in the belief that the computer, with its input, processing, and output stages of information management, provides an accurate model of how the brain itself works (Nickerson, 1986; Wickens, 1987; Wiener, 1960, 1948).

The validity of these conventional psychological theories of behavior has been carefully considered in a number of our publications (K.U. Smith and M.F. Smith, 1966; K.U. Smith and W.M. Smith, 1962; T.J. Smith and K.U. Smith, 1987a, 1987b). As open-loop theories, they neither predict nor readily accommodate the experimental evidence that behavior is guided in a continuous, dynamic fashion by means of motor feedback control of sensation, perception, and cognition (Figure 1), which behavioral cybernetic research indicates as the critical feedback control mechanism of performance and learning. Our viewpoint is that because the concepts of environmental and mental determination of behavior are deficient as feedback theories, and demonstrably incorrect as control theories, the conventional theoretical wisdom in psychology regarding behavior and learning is fatally flawed.

The fact that models and theories of environmental control or

information processing can be used to interpret certain features of human behavior and learning does not conclusively prove that human perception, cognition, and learning are purely mental in nature and psychophysically or environmentally regulated. In contrast, behavioral cybernetic theory not only accommodates all of the findings subsumed under conventional theories, it is the only doctrine which explains in a coherent manner the growing body of experimental evidence supporting the role of feedback control in behavior and learning. As summarized in the preceding section, results from a number of different experimental programs confirm the cybernetic view that all known types of behavioral operations and processes depend on peripheral, motor-sensory feedback control for their guidance, dynamics, and organization. This evidence shows that perceptual, cognitive, and learning skills associated with thought in speech, writing, graphic art, and music in all its forms are active, dynamic processes whose control can be shown to be affected by delays, displacements, distortions, and other variations in sensory feedback, in much the same way as are specialized body movements related to vision and hearing. The principal contribution of behavioral cybernetics, therefore, is to unify behavioral biology with physiological, cellular, and molecular biology to emphasize the universally cybernetic nature of biological organization and function.

One of the few contemporary psychologists to also advocate a feedback doctrine of behavior is Powers (1973a, 1973b), whose work has received prominent attention in past issues of this newsletter. Powers' conceptual approach in some respects resembles ours, as evidenced by the following quote from his *Science* article (Powers, 1973a, p. 351):

> In this article I intend to show as clearly as I can how a new theoretical approach to behavior can be developed simply by paying attention to feedback effects. There is nothing subtle about these effects; they are hidden only if they are taken for granted. All behavior involves strong feedback effects, whether one is considering spinal reflexes or self-actualization. Feedback is such an all-pervasive and fundamental aspect of behavior that it is as invisible as the air we breathe. Quite literally it is behavior—we know nothing of our own behavior but the feedback effects of our own outputs. To behave is to control perception.

Unfortunately, Powers undermines the credibility of his arguments by completely ignoring the behavioral cybernetic contributions of K.U. Smith and colleagues in the 12 years prior to 1973. There is no reference to this work in either his book or his *Science* article. This also is true of the recent *CC* article on behavioral cybernetics by Fennell (1988). The concept of feedback control of perception was clearly enunciated in their 1962 book (p. 7) by K.U. Smith and W.M. Smith:

> It is our belief that motion and perception are inseparably related. The development of perception in the child is the development of motion, and the only valid understanding of perception at any level is in terms of the movements that define it. The so-called perceptual activities of detection and discrimination involve the adaptive movements of orientation and differential response whether these movements are large, easily seen, overt responses or minimal, implicit responses. The organization and stability of the perceptual field depend on movements of orientation, location, and differential manipulation that have become established in the motion patterns of the individual.

The experimental findings cited earlier in this report also unequivocally demonstrate that behavioral feedback effects, rather than being invisible, are readily demonstrable using perturbed sensory feedback analysis. Indeed, the extensive review by Welch (1978) suggests that decrements in behavioral control evoked by sensory feedback perturbations represent a routine feature of everyday life. Human-factors research

extending back to World War II persuades us that spatial and temporal perturbations in sensory feedback, introduced across the human-machine interface by defects in ergonomic design, constitute the principal source of variability in human-machine performance. We endorse the behavioral feedback viewpoint of Powers, but his concept is not new and his treatment of the supporting evidence is incomplete.

The Neurogeometric Hypothesis
and Feedback Control of Learning

Rejection of open-loop theories of behavior and learning, in favor of the conclusion that behavior, perception, and cognition are feedback controlled, raises questions as to what precisely is being controlled, and how this control process facilitates and guides learning. The neurogeometric hypothesis addresses these questions (Smith, 1962, 1961a, 1961b; K.U. Smith and M.F. Smith, 1966; K.U. Smith and W.M. Smith, 1962; T.J. Smith and K.U. Smith, 1987a). The hypothesis originally was formulated as a theoretical construct to explain the effects on performance and learning of spatial perturbations in sensory feedback (Table 1). However, neurobiological evidence regarding neuronal plasticity and the spatial organization of the brain acquired in the past two decades suggests that the hypothesis is valid in a number of major respects.

The Neurogeometric Hypothesis. The neurogeometric hypothesis defines the principles of spatial organization of behavior, in terms of space-organized dynamic relations between the motor and receptor systems of the body, and the cognate spatial configuration of the afferent, integrative (associative) and efferent systems of the brain. Motor and receptor systems of the body have evolved as spatially-specialized, integrated systems which function through variable, space- and time-displaced feedback interactions between muscle activities and sensory input, which are inherent to receptor and effector activation. The brain detects these sensory feedback displacements and activates efferent outflow for muscular activity, thereby modulating the sensory feedback through self-stimulation to either compensate or adjust positively to the displacements.

The neuronal cytoarchitecture of the brain is also neurogeometric in organization. Receptor and motor systems of the body have both a structural and a spatial representation on the cerebral and/or cerebellar cortices. Structural representation is based on body anatomy (somatotopic representation). Spatial representation is based on the three-dimensional positions of receptor and effector systems in space at the time sensation and muscle activation occurs (neurogeometric representation). The peripheral, space-organized feedback relations between motor and sensory mechanisms are mediated by ensembles of cortical detector neurons in the brain, which are differentially activated in relation to the spatial and temporal properties of feedback displacement.

In the original formulation of the neurogeometric hypothesis, three classes of detector neurons were assumed to exist and operate in the brain as spatially-specific input detectors for detecting spatiotemporal differences in sensory activity. As illustrated in Figure 3, these classes are assumed to comprise: Type I, intrareceptor detectors; Type H, interreceptor detectors; and Type III, afferent-efferent detectors. The theory assumes that ensembles of these three classes of detector neurons could operate to control and produce integrated patterns of perception, such as depth vision, integrated patterns of dynamic movement, and integrated patterns for both dynamic control and memory of perception and movement.

Under this classification, intrareceptor and interreceptor detector neurons are specialized to sense spatiotemporal differences in stimulation of the same receptor, or between two or more receptors, produced either by self-generated movement or by environmental stimulation. These detected differences may represent anatomical or spatial displacements in environmentally- or movement-produced stimulation.

The theory assumes that afferent-efferent detector neurons are specialized to combine and integrate patterns of incoming sensory stimulation in relation to perceptual functioning, effector action, and memory. These neurons are assumed to mediate the integrative and associative mechanisms of the brain, by detecting primarily differences in stimulation between afferent and efferent activity for control of motor patterns, and by thereby bridging the space-organized afferent and efferent systems with association neurons mediating perception and memory. Eye-movement-controlled binocular depth perception is an example of associative perceptual integration of space-displaced sensory detection and motor activation.

According to the neurogeometric hypothesis, the functional organization of the body, including both skilled movements and behavioral-physiological integration, is founded on neurogeometric interactions of the motor and sensory systems. The control process is based upon motor coordinate detection, transformation, and feedback control of the spatial and temporal properties of sensory stimulation. The theory assumes that one movement generates a sensory signal that can be detected by the receptors of another movement mechanism which, in controlling this afferent signal as sensory feedback, generates a compliant stimulus signal back to the first movement mechanism. As shown in Figure 3, this feedback-locked interchange is mediated at brain levels by the three types of detector neurons described above. The theory also assumes that all modes of cognitive behavior, encompassing specialized communicative and symbolic operations of speech, musical performance, graphic behavior, handwriting, machine skills, social interactions, and expressive movements, become organized in terms of such spatially coordinate and compliant motor control mechanisms through learning and memory.

Feedback Control of Learning. Learning involves refinement of motor skills in the execution of motor coordinate activity, in the control of perception, and in cognitive expression as summarized above. Behavioral cybernetics assumes that learning is a self-regulated process wherein the direct sensory and physiological feedback effects of movement define the course and the biological mechanisms of maturation and learning (Smith, 1972a, 1966a; K.U. Smith and M.F. Smith, 1966; T.J. Smith and K.U. Smith, 1987a, 1969). From the earliest days of
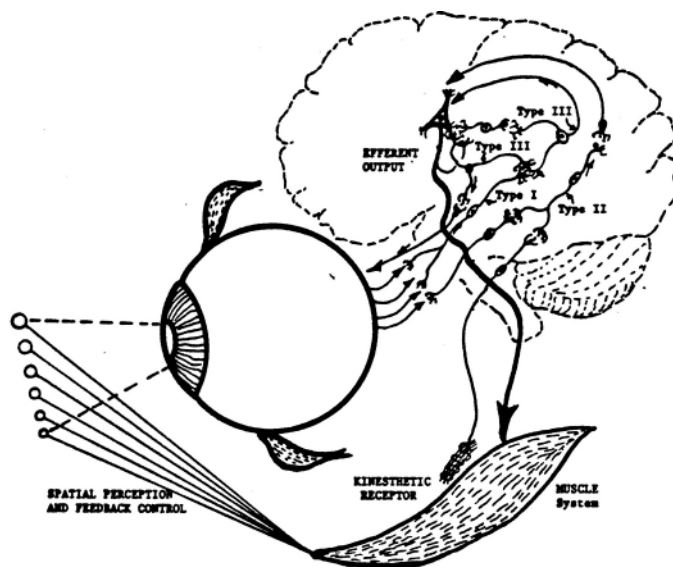

Figure 3. The neurogeometric hypothesis of the spatial organization of behavior.

learning research, it has been recognized that learning requires activity as well as giving rise to changes in activity. We assume that learning occurs as a result of motor control mechanisms which control feedback displacements, and thereby achieve spatiotemporal coherence, between self- and environmentally-generated sensory feedback. This displacement control process is mediated by neuronal detector mechanisms specified by the neurogeometric hypothesis, as outlined above. Permanent modifications in the activation properties of association neuronal ensembles occur as a result of such control, through mechanisms of neuronal plasticity which are now becoming better understood at the cellular and molecular levels (Barnes, 1986; Lynch and Baudry, 1984).

Learning establishes motor system capabilities for compliant control of different sources and patterns of sensory feedback which underlie all modes of behavioral and cognitive skills. For example, the use of language in speech and writing requires compliance in motor control mechanisms governing hearing, auditory perception, speech, and writing. All machine skills are based on the development of motor control mechanisms which ensure that sensory feedback from movements mediating machine control are compliant with sensory feedback from design features of the machine itself. Effective social tracking requires compliance in motor control of sensory feedback among the partners in the social group. Motor integration in the execution of athletic or artistic skills rests upon compliant control of sensory feedback from different muscles and muscle groups working in concert.

A variety of both behavioral and neurobiological evidence can be cited in support of the neurogeometric and learning feedback concepts just outlined. As we have already discussed, the fact that spatial and temporal perturbations in sensory feedback impair learning of various tracking and cognitive tasks (Table 1) supports a feedback interpretation of learning. We assume that the basis of this impairment is the inability of the motor system to effectively control the spatiotemporal properties of the perturbed sensory feedback, which degrades control compliance with self-produced sensory feedback generated by movements used to track the perturbations. Other supporting evidence comes from behavioral cybernetic research showing that visual-manual tracking of self-generated targets is more rapid and accurate than tracking of an environmentally-generated target (Sussman and Smith, 1970c). Related work also established that memory is feedback controlled, in that different conditions of sensory feedback perturbation degrade subject performance in a memory task (Smith and Sussman, 1969; Sussman and Smith, 1970d, 1970e, 1970f, 1969, 1967). The experimental antecedents for this work date back to 1932, when Jacobson recorded motor concomitants of human thinking.

It is noteworthy that the most successful example of robot learning to date (Kuperstein, 1988) applies a displacement-minimization algorithm, in which visual feedback from the movement of a (simulated) robot hand is topographically mapped onto visual feedback from the visual field viewed by the robot (camera) eyes. The algorithm is designed to minimize the mapping function. Over 5000 iterative learning trials, this approach achieved accurate robot hand positioning at a visual target, with no a priori instruction to the robot regarding the nature or position of the target. Kuperstein claims that his approach makes use of "new hypotheses... that suggest how at least one type of adaptive sensorimotor coordination might be developed and maintained. The hypotheses rely on the self-consistency between sensory and motor signals to achieve unsupervised learning." In fact, Smith first advocated such self-consistency as the basis of biological learning in the context of the original formulation of the neurogeometric hypothesis in 1961 (Smith, 1961b).

A variety of neurobiological evidence, reviewed in part by T.J. Smith and K.U. Smith (1987a), complements the behavioral cybernetic research findings in supporting a feedback theory of learning. A large body of sensory deprivation and sensory distortion research on animals (i.e., see Hubei, 1978; Sperry, 1951; Warkentin and Smith, 1937) conclusively demonstrates the phenomenon of neuronal plasticity, whereby the normal maturation of spatially organized behavior, and of the cytoarchitecture and functional properties of neuronal ensembles mediating such behavior, depends on space-structured motor activity during infancy and is impaired by the deprivation of such activity. The work of Jacobson and colleagues (Jacobson, 1973, 1967; Jacobson and Hunt, 1973) established that such plasticity involves functional validation, wherein activity-induced guidance, or validation, of brain maturation occurs at a specified stage of development, prior to which neurons remain functionally and organizationally pluripotent.

Molecular mechanisms underlying brain plasticity have been recently described by Aoki and Siekevitz (1988). In the visual pathway, it appears that an enzyme involved in protein phosphorylation (a common cellular transduction mechanism) is associated with the change in brain anatomy evoked by visual experience. Another dramatic example of brain plasticity in the visual system is reported by Sur, Garraghty, and Roe (1988), who showed in newborn ferrets that, prior to the validation stage, retinal afferents could be induced to project into the medial geniculate nucleus and the principal auditory thalamic nucleus, both of which normally are nonvisual centers. Subsequently, in the adult animals, normal responses to visual stimuli could be recorded from neurons in these nonvisual areas. We believe that learning generally embodies these same properties of neuronal plasticity and functional validation, through activity-induced feedback modification of neurogeometry and neurospecificity.

There is other neurobiological evidence which appears to directly substantiate the neurogeometric doctrine. The spatial organization of behavior has its beginnings in the earliest stages of embryogenesis, which is directed by spatially defined gradients and domains of genetic expression, chemical-metabolic influences, and cellular differentiation (Cooke, 1988; Smith, 1987). A number of observations have been made which show that time- and direction-specific detector neurons exist in both afferent and association brain regions, which mediate binaural hearing, binocular vision, bilateral movements, and tactual sensory functions. Recent studies also have shown that the cytoarchitecture and activity patterns of neuronal ensembles in the motor cortex are congruent, not only with muscle anatomy (somatotopic representation), but also with the position in space of muscles which these ensembles actuate (Georgopoulos, 1988; Georgopoulos, Schwartz, and Kettner, 1986; Humphrey, 1986). Thus, a given muscle can have multiple representation in the motor cortex, depending upon the geometric degrees of freedom of the spatial activity patterns in which it engages. This phenomenon may provide a means of directly testing the neurogeometric feedback theory of learning. As a new motor skill is learned, requiring novel movement geometry for a given muscle, more pronounced activation of the ensemble of cortical neurons mediating contraction of that muscle in the new geometry should emerge concomitantly.

The latter finding also encourages speculation regarding possible motor feedback control of short-term memory. Some years ago, Simon (1974) addressed the question of the information capacity, or chunk size, of short-term memory. His conclusion is that the chunk size is constant. His data suggest that the constant ranges from 5 to 7 chunks. We observe that the number 7 corresponds to the sum of the six directions in three-dimensional geometry (up-down, left-right, forward-back), plus the dimension of time. Is short-term memory neurogeometrically organized in accord with the spatiotemporal properties of motor

control of sensory feedback? In this regard, feedback research has shown that spatial perturbations in sensory feedback differentially affect learning in a tracking task, in relation to the spatial geometry of the movements required for the task (K.U. Smith and W.M. Smith, 1962).

Cognitive Cybernetics: Feedback Control of Thinking

Feedback concepts of behavior and learning outlined in the preceding two sections have prompted the development of a generalized behavioral cybernetic theory of the control, development, and evolution of human cognition. This theory assumes that thinking involves variable modes of feedback transformations in control of sensory feedback, as contrasted with direct psychomotor feedback control of environmental stimuli and sensation. In this interpretation, thinking is an active, motor-based, sensory feedback control process, not a detached mental process. The distinctive forms of cognitive behavior are assumed to be based on varied types of transformations of sensorimotor feedback relationships, as in instrumental behavior, nonverbal communication, speech, graphic representation, mathematical notation and reasoning, scientific research, technological design, art, literature, and so forth. Of these, instrumental and symbolic transformations of sensory feedback control most commonly mediate thinking. By means of these transformations, information from primary sensory sources is symbolized either in concrete or abstract terms, but the behavior processes retain their motor-sensory feedback control character and properties.

The process of sensory feedback transformation in cognition, as just defined, is assumed to involve feedback-controlled integration between two or more motor-sensory operations. That is to say, one motor-sensory mechanism generates an afferent signal which is detected but altered in some systematic way (reduced, compensated, elaborated, etc.) by a second motor-sensory mechanism, and that in turn generates a transformed and altered sensory input via the afferent pathway of the first mechanism. It is believed that such interlocked motor-sensory transformation processes can be established by learning via collateral efferent/association feedback circuits that are distributed throughout the brain.

Historical Perspective. The proclamations of contemporary cognitive scientists make it appear as if their mentalistic interpretations of cognition as a detached brain function constitute a novel chapter in the history of cognitive psychology (i.e., see Kihlstrom, 1987; Kosslyn, 1988; Waldrop, 1988a, 1988b, 1987; Wickens, 1987). The fact is that every phase and school of psychology—mentalistic, introspective, physiological, psychoanalytic, stimulus-response, and reinforcement—has had its own interpretation of cognitive processes, although the focus of theoretical accounts among these divisions may have differed. Thought has been described and investigated as a conscious process, as rational introspection, as memory, as a higher-brain process, as implicit muscle reactions, as a higher form of learning, as problem solving, as symbolic behavior, as decision making, and most recently as information processing comparable to the operations of a digital computer (Nickerson, 1986; Wickens, 1987). There is one common thread that binds these various concepts of cognition—none has considered the possible feedback basis of the process.

The history of efforts to understand thinking has been a record of futility in dealing with the psychology of behavior in objective, scientific terms. Mach (1905) was the first to explain thinking in terms of knowledge-and-error learning. Mach created the concept of "thought experiments." Ebbinghaus (1913) studied thought by his original methods of investigating memory. Titchener (1909) pointed out the motor and sensory components of thought in probing its introspective manifestations. James (1890) discussed the subject in terms of the "stream of consciousness," and gave the phenomenon its first dynamic

interpretation. Freud (1938), of course, changed the field radically by emphasizing unconscious motivation and its developmental sexual stages. The learning theorists, Thorndike (1932, 1927), Watson (1924), Hull (1943), and Skinner (1953, 1938) tried to reduce thinking to processes of conditioning and reinforcement learning or effect.

The origins of cognitive psychology have two branches; one in the reactions to reinforcement learning theory and one in the revival of mechanical modeling of brain function. Proposals that reinforcement and reward-and-punishment learning constitute the basis of behavior and thought were viewed early on by several people as unacceptable, if not ridiculous. Tolman (1932), Lewin (1936), Leeper (1951), Festinger (1957), and Snygg (1962), among others, proposed configural/perceptual and insight theories of the learning process, thus using the concept of cognition as an explanatory principle of behavior and learning, as cognitive science is doing today.

The other branch of today's cognitive psychology amounts to psychoanalyzing the digital computer. As we have noted, the computer model of the brain and thinking stems from the Wiener (1960, 1948) metaphor of the brain as a digital computer and information processor, and from Shannon's (1948) formulation of communication as a statistical process. Thus, the information processing model of the brain as a physiological digital computer should be referred to as the Wiener-Shannon metaphor, since the theory describes the processes of cognition and communication in terms of discrete, statistically identifiable, units of information exchange. This kind of theorizing, of course, sits very comfortably with modern stimulus-response psychologists concerned with cognition, since they persist in the view that behavior and brain function are atomized into discrete units of response which can be studied and integrated statistically.

The behavioral cybernetic and neurobiological evidence cited earlier supporting a feedback theory of learning calls into question these open-loop theories in favor of a generalized cybernetic interpretation of cognition. One recent neurobiological study brings added emphasis to this conclusion. Using double labeling and brain imaging techniques, John and colleagues (1986) examined the distribution of neuronal activity evoked in split-brain cats presented with familiar visual cues during performance of a stereotypic visual choice task. They observed a wide distribution of a large number of neurons (5-100 million) whose activity increased during presentation of the familiar cues. The conclusions drawn are noteworthy:

> Our results... do not fit well with a general computer-like model of the brain, with information stored in discrete registers, no matter how many in number. A radically different model is necessary. Our data... better support notions of cooperative processes, in which the nonrandom behavior of huge ensembles of neural elements mediates the integration and processing of information and the retrieval of memories... Memory and awareness in complex neural systems may depend upon presently unrecognized properties of the system as a whole, and not upon any of the elements that constitute the system.

We believe that the cybernetic interpretation of cognition as a motor coordinate process, based on integrated, dynamic motor behavioral control of sensory feedback, meets the criteria expressed in this conclusion.

Modes & Levels of Transformation of Motor-Sensory Feedback in Cognitive Behavior. The feedback theory of cognition assumes that there are many modes or parameters of transformation of feedback control and feedback-governed integration in biological, psychomotor, and cognitive operations. These represent dynamic ways in which a response, object, or event can be represented in a direct or altered way through cognitive transformation. They include: (1) replication; (2) free recall; (3) controlled recall; (4) translation; (5) transmission; (6) conver-

sion (7) compensation; (8) representation; (9) magnification; (10) reduction; (11) differentiation; (12) division; (13) multiplication; (14) elaboration; (15) integration; (16) summation; and/or (17) subtraction of objects, actions, or interactions of events related to motor-sensory feedback. Such modulation of motor-sensory feedback defines the process of cognition, and the use of thinking as an adaptive mode of behavior.

Feedback theory also assumes that there are several variable types of transformation of motor control of sensory processes which are involved in the development and evolution of cognition. These are:

1. *Biological transformations:* molecular, cellular, organic, physiological, and behavioral transformations involved in both phylogenetic evolution and ontogenetic development.
2. *Motor-sensory/perceptual transformations:* specific movements used to signify objects, actions, events, body states, and so forth, which may be variably adapted to different behavioral and perceptual control requirements.
3. *Tool/machine transformations:* production and use of tools and machines to transform primary modes of behavioral control and integration in environmental control operations, such as cutting, shearing, smashing, tearing, jamming, and so forth.
4. *Communication transformations:* social interactions created to signify and represent events, conditions, objects, etc., as in use of clothes, cosmetics, body marking, expressive dances, theater, and other communicative behaviors.
5. *Concrete symbolic transformations:* oral, written, and graphic symbols used to designate specific objects or events.
6. *Abstract symbolic transformations:* the use of abstract symbols (mathematical, linguistic, graphic, etc.) to denote general properties, interactions, and relationships between and among objects, objects and people, different people, geometric and space relations, temporal intervals and events, integrative operations and relationships, force and energy characteristics, and economic values (as opposed to use of concrete symbols to denote individual objects or events).
7. *Systems transformations:* the combination and integration of the different types of transformations indicated above to achieve specialized systems of communication, tool/machine performance, and symbolic systems such as spoken and written languages, artistic design, mathematics, literature, scientific research and communication, and so forth. For example, language in its many different forms combines emotional/physiological, motor-sensory/perceptual, communication, and concrete/abstract symbolic transformations to create the expressive, grammatic, phonetic, semantic, and social interactive operations and integrations of spoken and written language.

Feedback theory makes three additional assumptions about thinking in addition to the basic assumption that cognition involves different levels of concrete and abstract transformations of motor-sensory feedback control. They deal respectively with the biological basis and with the developmental and evolutionary elaboration of cognition.

Biological Basis of Cognition. Thinking has a fundamental biological basis, which requires integration of genetic, molecular, cellular, organic, and physiological feedback control. The process that we call cognition combines these biological with behavioral, instrumental, social, and perceptual transformations in unified systems ways to achieve integrated control of the body and of the sensory environment. Cognitive transformations of motor-sensory feedback emerged in evolution and emerge in the development of every individual as behavioral manifestations of primary levels of biological control.

Perhaps the best evidence for this assumption is recent work showing that localized vasodilatation of the cerebral vasculature in the human brain occurs in specific areas of the brain actuated during performance of specific cognitive tasks (Posner et al., 1988). Whatever the mechanisms of this phenomenon may be, the observation suggests direct feedback relationships between cognitive activity and: (1) cardiovascular and respiratory function at the physiological level; (2) vascular smooth muscle, glial, and brain neuronal cell function at the tissue and cellular level; and (3) energy metabolism and oxygen transport by neuronal, glial, and vascular cells. Feedback links between cognition and neuroendocrine, immunologic, and genetic functions also are implicated by the observation. Thus, just as somatic motor behavior is used to mediate cognition at the behavioral level through transformation of sensory feedback, so autonomic motor behavior mediates cognition at the organic, physiologic, cellular, and molecular levels of organization, presumably through oxygen transport and energy metabolic feedback relationships with active neurons.

Cognitive Transformations During Ontogeny. The developmental emergence of cognition is a cumulative, integrative process involving increasingly more complex levels of abstract symbolic, instrumental, and systems transformations of motor-sensory feedback control (Smith, 1987). This concept is illustrated in Figure 4, which suggests that the developmental emergence of cognitive skills recapitulates the phases of emergence and integration of cognitive operations that have occurred in human biosocial evolution. In the graph, development is pictured as an integrative, cumulative process. As new cognitive concepts and operations emerge, individual behavior, physiological functions, and thinking are consolidated at more complex systems levels. Cognitive concepts that emerge early in childhood are not lost as new concepts and operations are differentiated, but continue to develop at their own systems level. At any given age, the level of individual cognitive capacity (intelligence) is a function of the level of systems integration of the specialized cognitive operations and concepts developed up to that age. Long-term memory reflects these accumulated concepts and operations as applied to specific objects, people, events, interactions, and situations.

The relation of education to the age sequencing of cognitive development also is indicated in Figure 4. Parental and community training and education act as the social mechanisms for imparting systems transformations to behavioral and cognitive development, and thereby specializing cognitive operations and modes of thinking in the individual. Specific languages, forms of expression, cognitive musical, athletic, and machine skills, along with cognitive operations in writing, graphic art, recreation, religion, and work are learned and refined as individual specialized forms of communicative thinking before they are incorporated in individual patterns of thinking.

Evolutionary Transformations of Cognition. The evolution of thinking in man has involved emergence and cumulative retention of more and more complex and specialized levels of concrete, abstract/symbolic, and systems transformations of motorsensory feedback in behavior. Ontogenetic stages of cognitive development selectively recapitulate the evolutionary stages, but also extend and refine them as new levels of thinking. Because individual ontogenetic development therefore has represented the main selective mechanism for cognitive change in the human past, the process of evolution has been feedback controlled in terms of developmental selection. As new levels of thinking emerged among a limited number of creative individuals, they influenced individual cognitive development among offspring and acquaintances through a social tracking process. During their development, these latter individuals in turn altered and extended the established cognitive horizons leading to even more advanced levels of thinking and cognitively-related action. This process is highly ramified and formalized in human society today through written, spoken, and electronically transmitted language communicated worldwide. However, the same process in its rudimentary form can be observed among lower animals. Probing for grubs with thorns by Galapagos finches, salmon fishing habits by Alaskan brown bears, food cleansing in streams by African baboons,
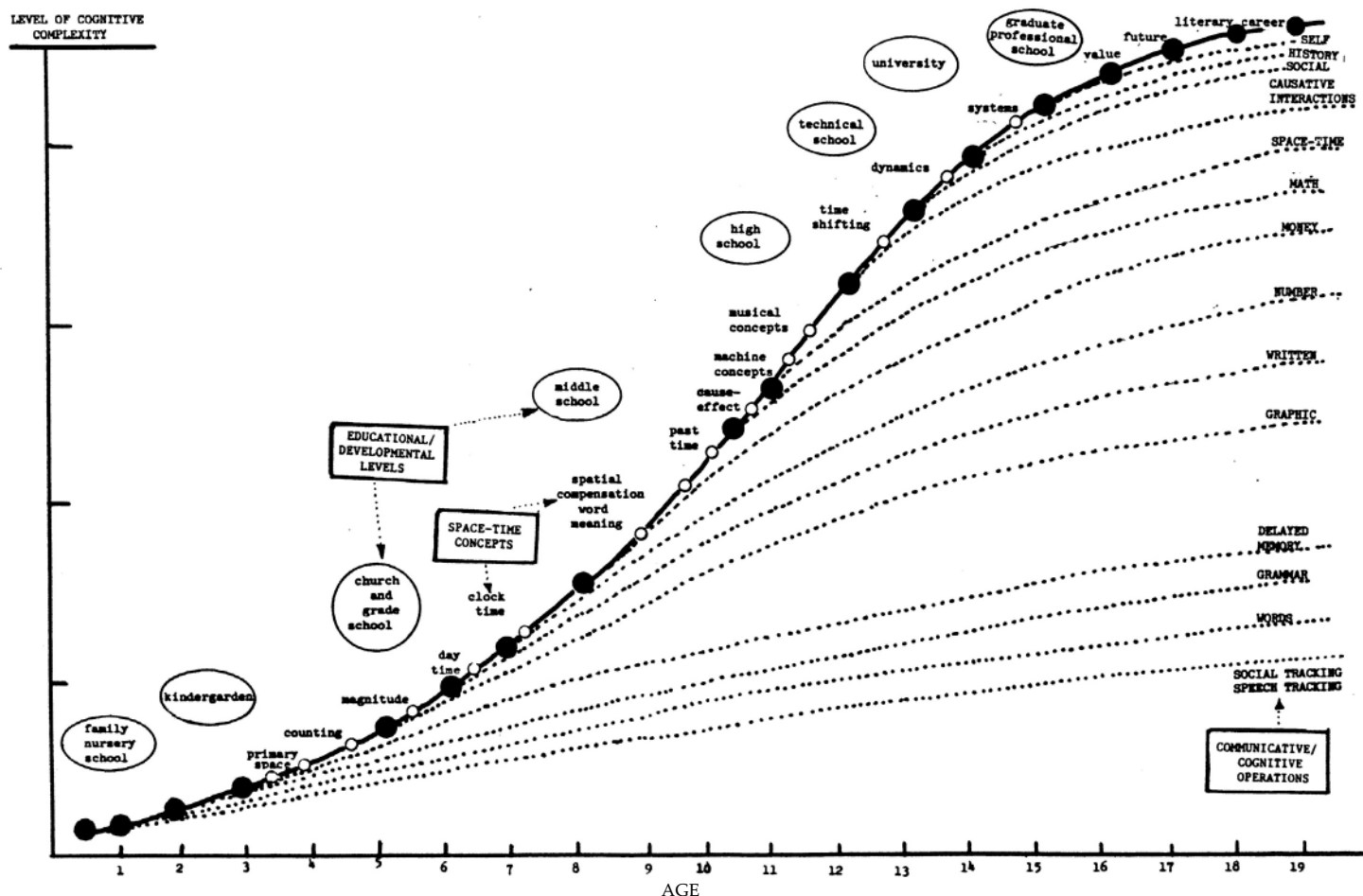
Figure 4. Human cognitive development as a cumulative and integrative transformation process.

or breaking clams by dropping them on rocks by seagulls, all represent reported examples of animal behavioral skills which apparently are perpetuated and retained in the animal community through social tracking.

As with individual development, the course of symbolic cognitive evolution has been buttressed by emergence of cognitively-related communication tools and machines, and by social conventions and operations in organization and management of society. The systems transformations of cognitive concepts and operations to form languages and special fields of thought has depended heavily on advances in all types of technology, including communicative technology, architecture, and social organization. For example, it is claimed (Ivins, 1953) that the inventions of printing and photography were essential advances to make possible rigorous scientific thought in most experimental fields of science. The invention and development of television and the computer testify to the preeminent role that the evolution of technology has had in interactively guiding the evolution of human cognitive behavior.

The evolution of man as a thinking animal has been a gradual process, extending over some two to three million years. As noted above, our view is that cognitive concepts and operations have emerged as adjunctive transformations of tool/machine behavior and of social interactive and communicative activity, and of individual psychomotor performance. The critical mystery of hominid cognitive evolution, however, is how specific cognitive operations emerged and were developed thereafter in the course of prehistory and history, and how these operations and concepts were reintegrated and trans formed into

compound and complex systems of thinking which we know today as languages, literature, poetry, arithmetic, mathematics, chronology, science, religion, art, technology, engineering, medicine, and so forth. Figure 5 gives our answer to both of these questions. Specific cognitive operations and their space-time concepts emerged at particular periods in the past, going back to the very earliest phases of evolution of hominids, in reaction to invention and creation of communicative techniques—such as gestures, body language, and speech—and of tools and devices, which promoted social interaction, foresight, prediction of action, and the understanding of time, space, and events. As such cognitive operations emerged they continued to be developed at a rate defined by their complexity and adaptive utility. As new operations were invented and used, older styles of thinking were not displaced and lost, but were integrated with the newer operations.

The graph in Figure 5 plots the level of man's cognitive resources going back in time for three million years, and also depicts the dual characteristics of evolution of human cognition. This process first created distinctive, specialized cognitive operations and concepts at particular periods in history and prehistory, which can be identified in anthropological and archeological records. It also involved the cumulative retention of these cognitive resources of mankind over the ages, and systems transformations of specific cognitive operations to form distinctive areas of knowledge, fields of thinking, specialized languages, and domains of development and education. The abscissa is a log time scale, not a linear scale, so ancient periods are compressed in comparison to modern periods. The effect of

this scaling is to increase the apparent rate of rise of the curve of evolutionary change in ancient periods in comparison with their true rate of rise and the rate of rise in modern periods. The rate at which man has become a thinking animal in all modes of adaptation has increased rapidly in the historical period, which began roughly with the invention of graphic communication at the start of the Magdalenian era (about 30,000 yrs ago).

The four ellipses to the left of the main curve in Figure 5 identify four main parameters of cognitive feedback control and integration which mediate the cognitive skills designated on the curve itself. The control process involved systematizing existing cognitive techniques, concepts, and technology, in relation to the distinctive operational (meaning), actuator (expressive), display (perceptual), and control (grammatical) features of the three main human-factored parameters of hominid evolution: language, tools/machines, and social organization and communication.

The process depicted in Figure 5 of emergence, consolidation, and integration of different cognitive operations, often in conjunction with creation of new types of tools, machines, architecture, social organizations, and symbolic systems, represents what can be termed the systems basis of cognition and language. Through systems transformations of adaptive psychomotor, tool/machine, communicative, architectural, and social-organizational behaviors, the human species guided its own technology, culture, and thought capabilities in a feedback-related manner. This evolutionary process has involved a broad spectrum of different cognitive behavioral mechanisms and strategies for converting and transforming existing ideas, tech-

nology, communication techniques, and social organizational patterns into particular cultures and bodies of knowledge, thus creating distinctive languages, methods of writing, business institutions, religions, industries, and so forth.

Computer-Mediated Behavioral Research

We consider that the computer-based research developed to validate the behavioral feedback concepts outlined in the preceding sections represents a major scientific contribution of behavioral cybernetics. Use of computerized experimental methods today is becoming more commonplace among human factors engineers and behavioral and physiological scientists, in relation to an emphasis on principles of systems analysis, systems development, and systems engineering. Nevertheless, much experimental research on behavioral and physiological systems remains preoccupied with end-point observations, rather than with direct, split-second, dynamic measurement of specific component interactions in system operations. The performance characteristics of behavioral-physiological, social, human-machine, and human-computer systems are defined in terms of these interactions and integrations. For a comprehensive understanding of such systems, therefore, their dynamic system relationships must be investigated experimentally and objectively in real time under controlled conditions. Computerized methods used in the Behavioral Cybernetics Laboratory were the first to achieve such split-second, dynamic measurement of interbehavioral, intersocial, man-machine, and human-computer interactions and integrations, and thus may be
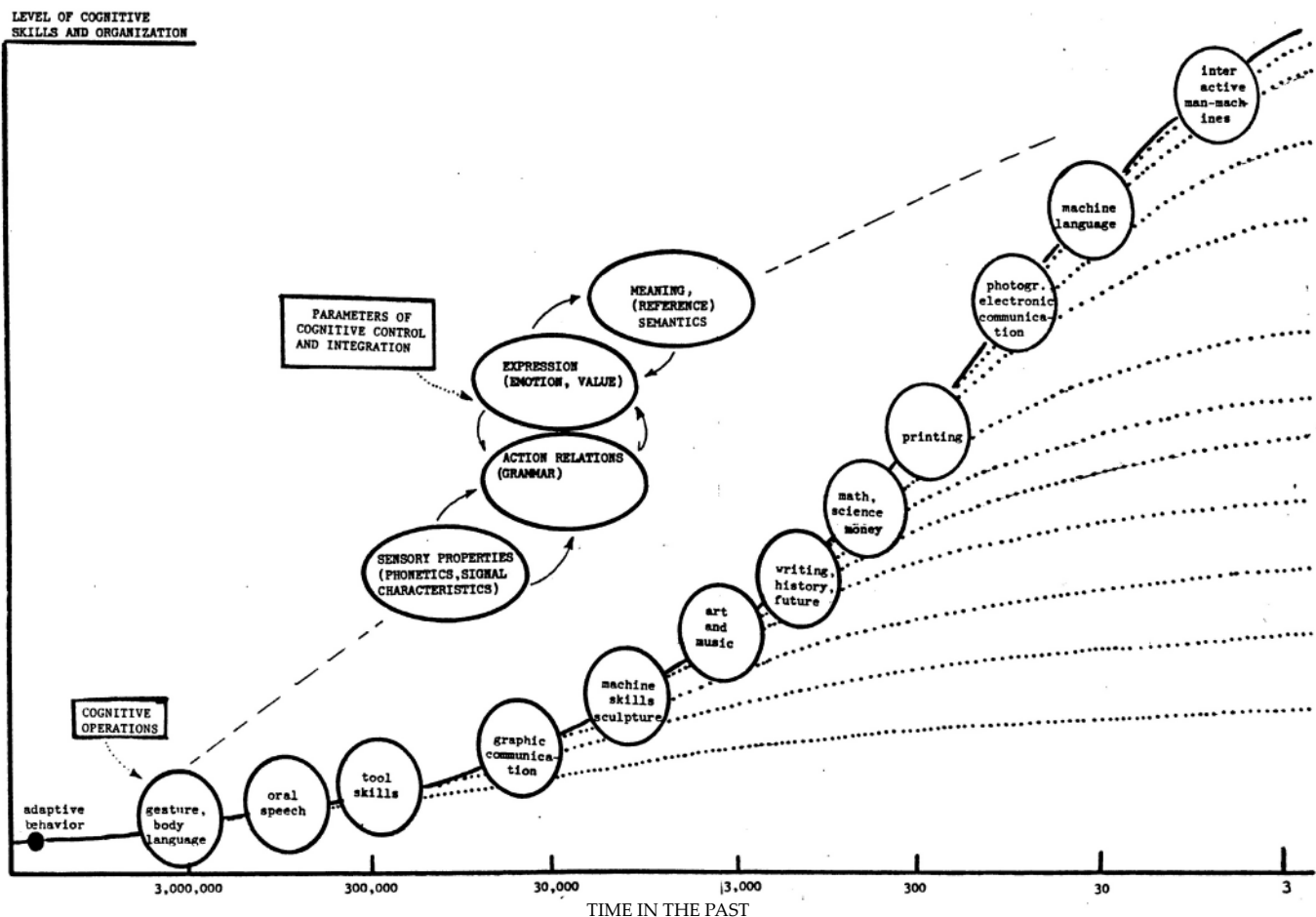
Figure 5. The transformational theory of the evolution of human thought.

considered the first experimental systems science on record. It is noteworthy that the original digital computer used in the laboratory, a Control Data Corporation 160-A (the second one produced), is now on display in the Cray Computer Museum in Chippewa Falls, Wisconsin, with a short description of its role in initiating advanced human factors research on computer-mediated human performance and cognition. The following paragraphs summarize the landmark methodological achievements of this program.

Vision Cybernetics: Science of Active Vision. The term active vision refers to an understanding of visual perception as a movement-controlled process. Innovative television and real-time computer methods were developed to analyze displaced and delayed vision, measure the main properties of feedback control which govern vision, investigate developmental, learning, and integrative aspects of dynamic visual behavior, and assess the temporal synchronization of the two eyes in depth perception (Smith and Arndt, 1969; K.U. Smith and M.F. Smith, 1966; K.U. Smith and W.M. Smith, 1962). This work was the first to show that television- and computer-based techniques are essential for rigorous and systematic study of the major motor-perceptual characteristics of visual feedback control.

Motorphonetic Cybernetics. The field of speech and language cybernetics was further developed with the first reported use of an analog-digital-analog computer system to digitize an analog record of speech, process the signal under program control, and reconvert the processed signal as high fidelity auditory speech feedback to a human subject (Smith, Ansell, Koehler, and Servos, 1964; Smith, Mysziewski, Mergen, and Koehler, 1963). The studies extended Stetson's (1951) motorphonetic research, as well as the seminal delayed auditory feedback techniques of Lee (1951, 1950). This research achieved the first direct computerized measurement of all of the critical motor-auditory feedback interrelationships involved in hearing, speech production, and speech movements, particularly those related to articulation of consonants and vowels in the formation of syllables (Abbs and Smith, 1970; Smith and Pesch, 1964; Sussman, 1970; Sussman and Smith, 1971, 1970a, 1970b). This research also revealed the phenomenon of facial laterality (Smith, 1984). Findings regarding the lateral specialization of facial and speech articulatory muscles in verbal, nonverbal, and musical cognitive operations suggest that hemispheric specialization in cognition is controlled by facial laterality.

Experimental Social Cybernetics. The research established the field of experimental social cybernetics, and showed in numerous experiments that social interactive movements and perceptions are controlled and integrated on a feedback basis. It represented the first application of computer-based methodology to critically evaluate the spatiotemporal properties of sensory feedback control in mutual social tracking among two- and three-person subject groups (Smith, 1974a, 1972b, 1968a; Kao and Smith, 1971; Rothe, 1973; Sauter, 1971; Sauter and Smith, 1971; Smith and Arndt, 1969; Smith and Kao, 1971; Ting, Smith, and Smith, 1972).

Integrated Computer 'Television Operations. Many future automated systems will rely upon integrated television/computer systems, wherein television cameras will provide inputs for computer mediation of telerobot activities, or for remote visual-manual guidance of computer- or robot-mediated production or processing operations. Monitor outputs of computerized television images can be used to provide human operators with critical on-going vision of the operations via virtual dynamic imaging, as with head-mounted displays in high-performance aircraft. Preliminary research has been done on exploring some of the human-factors issues of operation of integrated television/computer systems. This research (K.U. Smith and W.M. Smith, 1962) began with extensive investigations of displaced televised visions, in which the ability of human operators to perform various tasks was measured under variable conditions of inverted, reversed, inverted-reversed, and angularly

displaced televised feedback of their own movements. In addition, the primary problems of stereo-television (Gould and Smith, 1964; Smith and Gould, 1964) and stereo-television pursuit tracking also were investigated, along with social interactive performance via linked camera-monitor systems (Smith, 1962a). The effects of delayed televised feedback on different performances was explored in a number of experiments (Smith, 1962a). The problems of displaced televised guidance of vehicles were investigated (Kao and Smith, 1969) in terms of televised guidance of an actual car on an airport tarmac. Extensive design studies of computer-controlled eye movement and head movement guided television cameras were carried out (Smith and Coleman, 1970) in order to determine the feasibility of remotely controlled vision in rehabilitative industry and space science.

Motor Feedback Control of Visual Perception

Research on active vision using television- and computer-based methods have helped to advance understanding of the motor feedback control of visual perception (Putz and Smith, 1971, 1970b, 1970c; Schmidt, Ansell, and Servos, 1967; Schmidt, Gottlieb, Coleman, and Smith, 1974; Schmidt, Putz, and Smith, 1970; Schmidt and Smith, 1971; Smith, 1970a, 1963b, 1961a; Smith and Greene, 1963; Smith and Molitor, 1969a, 1969b; Smith and Putz, 1970a; Smith, Putz, and Molitor, 1970, 1969a, 1966). The central scientific question addressed by this research dates back to the time of Helmholtz (1856-1866), who proposed in his experiential theory of visual perception that space perception is learned. Research by Stratton, Wooster, Brown, Cox, Ewert, Kohler, and others earlier in this century (reviewed by K.U. Smith and W.M. Smith, 1962) established using various mirror and prism techniques that human subjects (but not some lower animals) could adapt to inversions, reversals, and displacements in the visual field. However, as noted previously, most studies show that such adaptation is never complete (K.U. Smith and W.M. Smith, 1962; Welch, 1978). Behavioral cybernetic research extended this earlier work in the following major ways, by showing that: (1) television- and computer-based feedback techniques provide a powerful and versatile means of introducing controlled spatial and temporal perturbations in visual sensory feedback; (2) visual-manual performance is degraded most by inversion, and least by reversal, of the visual field, with combined inversion-reversal intermediate in effect; (3) under conditions of angular displacement of visual feedback, performance is degraded beyond a certain point, termed the breakdown angle; (4) the specific performance effects of spatial perturbations in visual feedback are dependent upon the spatial geometry of the motor task under investigation; and (5) relative to the effects of spatial perturbations, subjects are less tolerant of feedback delays in visual feedback.

Because it shows that humans can partially adapt to spatial disturbances in visual feedback, this body of research tends to confirm and extend the original thesis of Helmholtz (18561866) that visual space perception is learned rather than innate in nature. Also relevant to this conclusion is neurobiological evidence, outlined earlier, which shows that during ontogeny, there is a functional validation period during which neural organization of visual centers in the brain is influenced by visual experience. However, in the visual feedback studies summarized above, the relationship between eye movements and projection of the visual image upon the retina remained normal, even though the image itself may have been spatially distorted or temporally delayed. In order to investigate how the spatial organization of image projection by movements of the eye itself onto the retina affects visual perception, a scleral contact lens with a built-in dove prism was devised that could reverse eye-movement projection of the visual image onto the retina (Smith, 1970a;

Smith and Molitor, 1969b). One 45-minute experiment was conducted on one subject, the senior author of this report, with the following results (Smith, 1970a, p. 180):

> This scleral-lens and dove prism was worn by me for about forty-five minutes, which was as long as the skittered vision produced by the reversing prism could be tolerated. When first put on, the prism caused almost complete blindness in the affected eye. After some ten or fifteen minutes, it was possible to try to fixate distant objects but this could be done only by looking through the fixated object. The term "skittered vision" best describes the unstable and jittery nature of the visual field viewed through the reversing prism. Moreover, the experience was extremely upsetting and painful even though the scleral *lens* itself caused no difficulty or pain. It was necessary to cover the affected eye periodically to get some relief from the unsettling effect of the vision. Vision itself was blurred for the most part. The impression at the end of the experimental session was that it would be impossible to wear such prisms on both eyes for any period of time and that the effects were too unsettling and painful to try on subjects other than the experimenter himself.

Apparently, this is only study of this phenomenon so far conducted (see Welch, 1978, p. 124).

The body of research summarized above provides insight into the nature of visual perception as a feedback controlled process. That subjects can perceptually adapt, albeit incompletely, to spatial distortions in the visual field tends to support the experiential doctrine of Helmholtz (1856-1866). However, such perceptual adaptation does not occur when the spatial relationships between eye-movement control of the visual field and image projection onto the retina are confounded. This finding strongly suggests that once functional validation has occurred, our perception of the visual world is defined in a stringent and probably invariant manner by eye-movement control of the spatial distribution of light energy onto retinal photoreceptors. Because it extends the Helmholtz doctrine to more clearly delineate the motor feedback controlled basis of visual perception, we consider this body of research to have made a fundamental contribution to scientific understanding of vision (Smith, 1970a).

Motor Feedback Control of Language, Speech, & Music

As noted earlier, behavioral cybernetic research has built upon the original motorphonetic doctrine of Stetson (1951), and the original delayed auditory feedback experiments of Lee (1951, 1950), in investigating the motor feedback control properties of cognitive expression in speech, language, and music (Abbs and Smith, 1970; Smith and Pesch, 1964; Sussman, 1970; Sussman and Smith, 1971). During cultural evolution, languages have been human factored in terms of specific symbolic, operational, and systems transformations of motorphonetic feedback control of speech. This motorphonetic interpretation is illustrated in Figure 6, which depicts the role of muscle activities of the abdomen, diaphragm, chest, neck, mouth, tongue, lips, and jaw in producing specific components of speech (Stetson, 1951). Those of the abdomen and diaphragm control breath pressure and breath grouping of syllables. Those of the chest produce pulses of air which are vibrated to become syllable units. Those of the neck, mouth, tongue, lips, and jaw articulate vowel and consonant sounds. Through particular biosocial and biocultural traditions in different areas of the world, these three basic speech operations are distinctively human factored to form specialized phonetic-syllable patterns of words, sentences, and phrases that are integrated and organized in terms of their: (1) reference meaning in relation to objects, actions, and interactions in events; (2) expressive meaning or significance; (3) grammar or action meaning and relationships; and (4) phonetic structure. The muscles that articulate consonants and vowels predominate
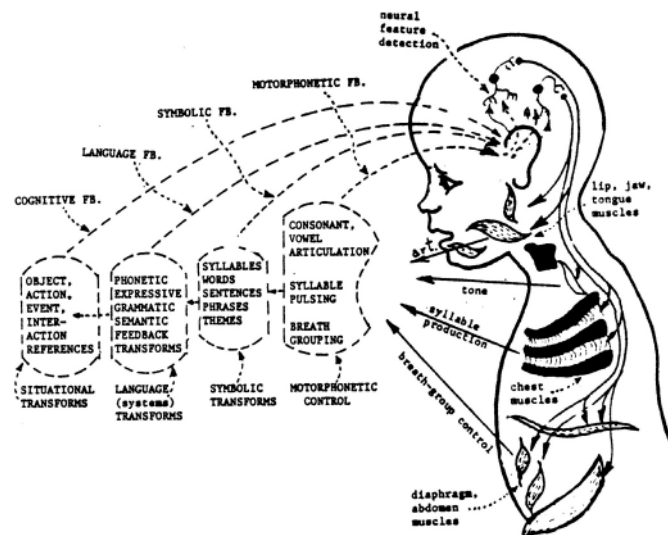
Figure 6. Cognitive feedback basis of language, speech, and hearing.

in control of the phonetic structure. Abdominal/diaphragm muscles predominate in control of phrasing and expression. The direct muscles that govern syllable production predominate in control of word structure, word order, and grammar.

The individual speaker cognitively controls speech by motor activity and auditory feedback, which contain sensory signals that identify the consonants, vowels, syllable pulses, and breath pressures and groupings which represent the basic motorphonetic feedback elements of speech, and also the symbolic systems and cognitive features of speech. The speaker hears words, phrases, and sentences with meaning arranged in proper grammatic relations and order, and varied in expression to reflect the emotional meaning and motivational values of the words and phrases. The latter represent the human-factored systems transformations of organized language.

The basic systems transformations and operations of speech, which define the similarity and structures of different languages cognitively throughout the world, are best understood, not in terms of disembodied mental functions (Chomsky, 1965), but in terms of the dynamics and human factors in language design. Just as machines and social organizations are designed and operated in terms of systems control structures and functions, languages likewise have evolved and are used cognitively in terms of their control (grammatical), display (phonetic), actuator (expressive), and operational (semantic/meaning) characteristics. The integration of these feedback control and operational feedback characteristics define both the generally high degree of specialization of different languages, and also the specialization of language and thinking in particular individuals. It is no accident of evolution that languages have been extended and refined by the development of machines, architecture, and technology, and of social organization and communication influenced by machines and technology, since comparable human-factored control, display, actuator, and operational systems characteristics are also involved in the development and behavioral control of tools, machines, and technological systems by both individuals and social groups.

Motorphonetics of Cognitive Musical Expression. One of the most significant and revealing studies dealing with motor control of cognition started out with investigation of bilateral integration of the face in speech. The theory which initiated and guided design of the research is that the processes of coarticulation and integration of consonant and vowel sounds in forming syllables

are mediated by bilateral coordination of the two sides of the face and mouth. The theory assumes that one side of the face, the dominant side, controls consonant sounds predominantly while the other side, the subordinate side, controls vowel formation and resonance.

Computerized experiments were designed and set up to test the validity of this facial-laterality theory of coarticulation of consonants and vowels in speech. New types of lip-movement (Sussman and Smith, 1970b), jaw-movement (Sussman and Smith, 1970a), and tongue-movement transducers were devised and used with electromyographic recording methods to measure the relative differences in movement and muscle activity by the two sides of the face and mouth in enunciating specific syllables. The research went on for almost a decade with confusing results. It was assumed in this first stage of the research that all people would be right facial dominant. The results indicated differences in amount of activity of the two sides of the face and mouth, but results were not consistent for different subjects. Some individuals showed greater amounts of articulatory activity on one side, others showed more activity on the other.

It was realized finally that this study had established the phenomenon of individual "facedness" (Smith, 1984). Some subjects were right-faced in articulating speech, others were left-faced. An extensive survey was conducted of the percentage of right-faced and left-faced people in national populations of the U.S., Spain, Norway, Mexico, and Canada. It was established that the percentage of right-faced people varies from roughly 78 to 88 in these different countries, while the percentage of left-faced persons ranges from about 10 to 18.

A series of occupational surveys was then started. The first group of people surveyed were opera singers, as observed on TV and in Metropolitan Opera photographs. A remarkable finding came out. Instead of being predominantly right-faced as are members of the general population, over a hundred talented opera singers were observed to be consistently left faced, with almost no exceptions. All other types of highly talented musicians—instrumentalists, jazz and country-western artists, choral singers, composers, and conductors—are judged to be consistently left-faced. Some of the greatest names in music—Bach, Beethoven, Brahms, Mozart, Mahler, Wagner, Presley, Pavarotti, Domingo, Previn—all are judged to be or to have been left-faced. It is concluded that the cognitive and talent factors in musicianship are governed primarily by facial laterality coordination.

Conversely, surveys of business executives and language-talented people have found such individuals to be predominantly right-faced, above the percentage level of right-facedness in the general population. All U.S. presidents, for example, are judged to be or to have been right-faced. It is concluded that the musical domain and the language domain represent two different cognitive worlds, which are governed primarily by specific characteristics of facial laterality in the control and integration of the cognitive operations of musical performance and fluent speech, respectively.

Behavioral-Physiological Integration and Rehabilitative Cybernetics

Behavioral cybernetic research made early contributions to the development of the theory and experimental analysis of behavioral control of physiological functioning, popularly known as biofeedback. The research also provided early demonstration that biofeedback methods can have clinical rehabilitative benefits. The origin of biofeedback methods, or visceral conditioning as they also are termed, is commonly attributed (i.e., see Schneider and Tarshis, 1980, pp. 394)398) to the work of Miller and colleagues (Barber et al., 1971; Dicara, 1970; Miller, 1969; Schwartz, 1977). In 1967, the same year that Miller and colleagues first reported that curarized rats could be trained

to modulate their heart rate (see Miller, 1969), Ansell, Waisbrot and Smith reported the first use of computer-mediated methods to train human subjects to voluntarily control their heart rate through provision of visual feedback. Computerized biofeedback methods also were used to desensitize a patient suffering from sensory-induced epilepsy (Ansell, Smith, Booker, and Forster, 1966). The method involved programming the computer to detect alpha waves in the EEG heralding onset of a seizure, and to automatically modulate the flickering of a bank of lights used to precipitate the seizure. Subsequently, visual and auditory biofeedback of electromyographic signals was used in neuromuscular retraining, to help a facial nerve patient reestablish control of her facial musculature (Booker, Rubow, and Coleman, 1969). Feedback delay effects on voluntary control of muscle activation, using electromyographic biofeedback methods, were also examined by Rubow and Smith (1971). This work helped to found the field of biofeedback research and to show that behavioral control of physiological functions can be used effectively in clinical rehabilitation.

From a behavioral cybernetic perspective, the finding that external behavior and internal physiology are feedback-linked is a predictable consequence of the role of the motor system in integrating behavior (Smith, 1973; K.U. Smith and T.J. Smith, 1970). Physiological, cellular, and molecular research over the past two decades has established that organ system and metabolic functions generally are directly influenced by motor activity through a constellation of feedback control mechanisms (T.J. Smith and K.U. Smith, 1987a). For example, oxygen needs of working muscle are met through feedback mechanisms linking oxygen transport by the cardiorespiratory and vascular systems with muscle activity. Energy demands of working muscle are met via feedback mechanisms which integrate energy metabolic control of gastrointestinal, hepatic, renal, and fatty tissue function. These feedback mechanisms are hierarchically organized and differentially actuated in relation to specific behavioral characteristics of motor activity, such as the muscle groups involved, movement geometry, the mix of static (postural) versus dynamic movement demands, the mix of positive (concentric) versus negative (eccentric) muscle contraction requirements, and the magnitude and distribution of energy metabolic requirements among skeletal, ventilatory, cardiac, and autonomic smooth muscle tissue. As already noted, recent imaging research has established that neuronal activation in the brain also is feedback linked with localized increases in cerebral blood flow, mediated by vasodilatation of cerebral vascular smooth muscle in different regions of the brain activated during different specialized cognitive and perceptual tasks (Posner et al., 1988).

To denote the fact that both behavioral and physiological functions are maintained and controlled through dynamic, continuous motor activity, the term *homeokinesis* has been introduced (K.U. Smith and M.F. Smith, 1966, p. 471) as an alternative to homeostasis. The former term more accurately indicates that behavior and physiology are maintained as continuously varying, rather than static or equilibrium, processes, and that movement mediates the control process. This introduction of the term homeokinesis predates by three years its similar use by Iberall and colleagues (Iberall and McCulloch, 1969; Soodak and Iberall, 1978), despite their claim to its origins.

As a direct development from the biofeedback studies cited above, behavioral cybernetic research established the field of experimental rehabilitative cybernetics—the application of human-factors, behavioral feedback principles to the experimental study of human factors design of rehabilitative devices, programs, development and training procedures, rehabilitative machines, and public facilities for the handicapped (Smith, 1977, 1971b; Smith and Henry, 1967; K.U. Smith and M.F. Smith, 1966; K.U. Smith and T.J. Smith, 1969). Spin-off cybernetic rehabilitative programs of this research,

including Public Health Service regulations for public facilities, education, and employment for the handicapped, may be traced to research papers cited above which emphasized for the first time the need to human factor public facilities and behavioral resources for the disabled. The research and the formulation of the theoretical-experimental field of rehabilitative cybernetics thus was the first to delineate the principles and properties of active perception in understanding human-factors design in disability rehabilitation, and the role of behavioral feedback control in rehabilitative mechanisms.

Developmental Cybernetics

The field of developmental cybernetics was established through both television and computerized experimentation (Smith, 1987a). The basic theory guiding this work is that living organisms feedback organize and control their own development throughout their lifespan, from fertilization to death, through the learning and application of specialized motor coordinate skills. We assume that such motor behavioral feedback control integrates development at all lower hierarchical levels—genetic, molecular and metabolic, cellular, physiological, and organ system. The application of this theory to account for the development of cognitive skills (see Figure 4) has been discussed in a previous section.

To examine the ontogenetic emergence and lifespan differentiation of behavioral feedback control, many different types of feedback research were carried out, particularly studies of self-control of the perceptual environment in infants and young children, critical phases in development of social tracking skills, feedback analyses of children's graphic perception and behavior in handwriting and speech, human factors analysis of techniques of training speech and handwriting in children, and facial laterality in neonates, infants, and young children (Greene and Smith, 1963; Rothe, 1973; Smith, 1987a, 1984, 1972b, 1968a; Smith and Greene, 1962; Smith, Zwerg, and Smith, 1963). The findings generally show that although infants can control their behavioral and perceptual environment through specific, orienting movement patterns, human ability to effectively control spatial or temporal perturbations in sensory feedback does not fully mature until the teens. This finding conforms to the cybernetic theory, previously discussed, of cognitive ontogeny as a cumulative, integrative process in which cognitive transformations of feedback control become increasingly refined (Figure 4).

Experimental developmental cybernetics also includes investigation of the role of human-factors design of employment procedures (testing, seniority, apprenticeship programs) on adult development of workers. Studies of this sort have been done in the field of industry, and results of the applied systems research interpreted and related to data from behavioral feedback research on development, learning, and aging (Smith, 1989, 1970b, 1966c, 1965c, 1965d; K.U. Smith and T.J. Smith, 1989).

Social Cybernetics

The formulation of the principles of social behavior and interaction in behavioral feedback terms, and their experimental analysis, has been an objective of the field of behavioral cybernetics since it was first drawn up in the early fifties. This formulation is described by the term social cybernetic or social feedback theory, and the related experimental analysis has involved the study of social tracking under controlled behavioral feedback conditions (Kao and Smith, 1971; Sauter, 1971; Sauter and Smith, 1971; Smith, 1983, 1974a, 1972b, 1971b, 1968a; Smith and Arndt, 1969; Smith and Kao, 1971; Ting, Smith, and Smith, 1972).

The social cybernetic model assumes that social behavior in all of its forms is based on mutual social tracking of sensory feedback between and among two or more individuals. The incorporation of the tracking concept in social feedback theory has a biological basis, and is intended to relate social to biological feedback doctrines. During the past two decades, it has become apparent that the concept of continuously controlled tracking can be applied meaningfully to many manifestations of feedback control in living systems. Feedback-controlled tracking operations occur genetically in cellular repair of DNA lesions that produce mutations, in cells to regulate the effects of the environment on cell division and replication, and in organs to control differentiation of cells in relation to the environment during development. In the behavioral cybernetic approach, social tracking is the social behavioral extension of these fundamental biological tracking operations. The assumption is that individuals engage in variable social tracking operations not only to coordinate their overt behavior, but also to exert some measure of sustained feedback control over their physiological functions. We suggest that the theory of social cybernetics and its supporting experimental evidence provides the key to scientific understanding of the feedback relationships between external social and individual behavioral, and internal physiological/biological functions, an understanding that has escaped social theorists and biologists for well over a century.

Social Tracking and Social Feedback. The cybernetic model of social behavior as a social tracking process is illustrated in Figure 7. Social tracking is based on the specialized, coordinate motor behavioral and physiological responses which a given individual in a social group initiates in order to track and thereby control sensory feedback generated by the motor behavior of others in the group. Movements of one person generate sensory input to a second, who, in controlling this input as sensory feedback, generates input of a compliant sort back to the first person, and so on. During group social tracking, one individual generates sensory feedback which all other group members track in a compliant manner through their behavioral-physiological sensory feedback control mechanisms. In this manner, the group as a whole establishes a system of reciprocal social tracking relationships, in which the social partners become engaged in mutual exchange and control of sensory feedback to establish a yoked, behavioral-physiological, feedback-integrated system.

As suggested by the feedback parameters and control characteristics listed in Figure 7, social tracking typically involves many modes, variations, and conditions of mutual sensory feedback control. It may consist of varied interpersonal interactions, such as speech communication, or coordinate social skills, such as dancing, infant nursing of a mother, sexual intercourse, or teacher-student relationships. It can involve matched or series-linked behavior. It may be directed to mutual control of the social interaction, as in sexual intercourse, or to control of the physical or social environment, as in team sports activity. It may involve positive, negative, compensatory, complementary, differential, integrative, and/or transformed types of social feedback control of activity by the interacting persons. In group social tracking, all of these varied modes and conditions may occur between groups, between a group and an individual, and between organized groups and institutions. This social cybernetic model can be applied generally to interpret and analyze the systems properties of the entire spectrum of social behavior, encompassing work, verbal and nonverbal communication, language, predation, courtship and mating, artistic expression, parent-child bonding, education and training, and organizational and institutional behavior.

In comparison to social interaction between two individuals, group social tracking embodies more complex and ramified patterns and modes of sensory feedback control. As shown in Figure 7, seven distinct types of group social tracking relation-
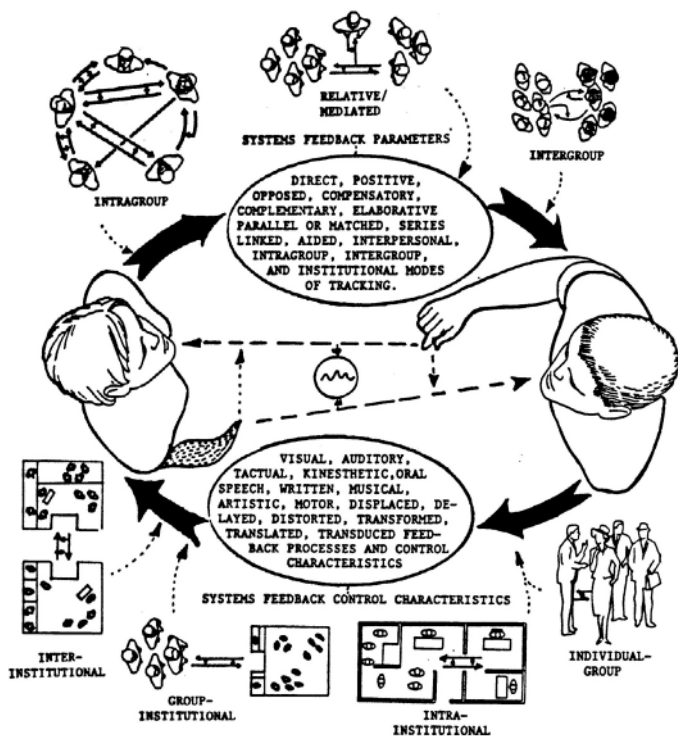
Figure 7. Social cybernetic model of social tracking.

ships can be specified: (1) individual-group; (2) intergroup; (3) intragroup; (4) mediated group; (5) inter-institutional; (6) intra-institutional; and (7) group-institutional interactions. A general systems analysis of the human-factors design of group and institutional organizations suggests that this limited number of social interactive groupings describes the large majority of group structures in society (Smith, 1974a). This analysis also indicates that six modes of social systems feedback control can account for most of the social tracking patterns between individuals in the types of interactions designated above: (1) interactive behavioral feedback control of individual group members; (2) interactive behavioral feedback control of subgroups of the main group; (3) hierarchical executive tracking and control operations; (4) feedback control of boundary relationships and limiting functions; (5) integrative control of organization relative to regulation of the physical and social environment; and (6) developmental changes in these systems control parameters.

The social cybernetic model revises open-loop theories of social communication and interaction to provide a closed-loop, integrative feedback interpretation of social behavior. Conventional theories in social psychology today are dominated by two open-loop assumptions about social behavior. The first, Darwinian, assumption is that provision of environmental stimuli from other individuals, such as rewards or punishments, directly determines social behavior (Homans, 1974). This theory is couched in the familiar rubric of operant conditioning which we have briefly considered, and rejected, earlier. The social cybernetic perspective is that each individual in a social framework uses motor behavior to track and thereby feedback control all sources of stimulation from others, which include the complex, multimodal combinations of material and behavioral sensory feedback which are simplistically termed rewards and punishments. Insight into social behavior therefore rests upon characterization, not merely of the nature of social stimulation, but more critically of the self-governed feedback mechanisms which track and control such stimulation.

Information theory represents the second major open-loop influence on social psychology. For decades, social and information scientists and psycholinguists have claimed that a bivariate statistical model of communication, based on information theory (Shannon, 1948), provides fundamental behavioral and systems insights into speech and other forms of communication. The validity of this model is undermined by the multivariate nature of speech itself, whose production is highly specialized and individualized, and by the evident feedback qualities of both verbal and nonverbal social tracking. The statistical model and information theory are open-loop formulations of information exchange. They lack integrative and dynamic specifications, and overgeneralize the dynamics of instrumental, behavioral, and social communication processes. Because it reduces communication to a process involving exchange of bits that occur in sequence between a source and a receiver through a channel in the presence of noise, the statistical model has no resources to deal with varied feedback patterns, modes, and conditions of communication that can occur between individuals, between groups, between institutions, between humans and machines, and between humans and computers. Notably, at the very threshold of scientific concern regarding human-computer communication, Licklider and Weller (1951), who were among the first psychologists to become interested in the application of information theory to communication, showed in an analysis of speech perception that motor patterning of the speech stimulus or auditory form is more important than any physical stimulus qualities in conveying meaning.

Findings from cybernetic research, regarding the detrimental effects of spatial and temporal perturbations in sensory feedback on the accuracy of social tracking in two- and three-person groups (Table 1), call into question the validity of open-loop theories of social interaction. The equally significant conclusion of this study, however, relates to methodology. For the first time, dynamic social interactions in the form of social tracking patterns have been measured on a split-second, real-time basis to provide a controlled social systems feedback to interacting partners. Such measurement or monitoring has been shown to be quite beyond the unaided observer who tries to judge or measure by eye how accurately two other people are interacting. The methods open the field of social interaction research to unlimited exploration of the rewarding spectrum of social interactions in all facets of human activity, including human-computer interactions.

Social Physiological Feedback. One of the most critical aspects of social interaction for understanding communication, primary social behaviors, and human-computer interactions that mimic social tracking functions, is the fact that such interactions have direct physiological effects on the interacting individuals. A number of experiments have indicated that two persons who are interacting behaviorally may also show correlated changes in respiration, heart rate, and blood pressure. Such correlated physiological concomitants of social tracking have been described in interpersonal interactions (Malmo, et al., 1957) in active and passive participation in two-person groups (Nowlin, et al., 1968), in relation to changes in social interactions (Boyd and Di Mascio, 1954), in relation to community pressure (Bogdonoff, et al., 1962), and during psychotherapeutic interviews (Coleman, et al., 1956). Bales (1951) found that when a client and therapist in counseling reached some degree of agreement, compliant variations occurred in skin temperature, galvanic skin reflex, and heart rate in both individuals. Computerized studies of the physiological concomitants of interpersonal tracking (Sauter, 1971; M. Smith, 1973) indicate that the physiological changes varied with the conditions of the social tracking.

The main implication of the experimental findings on the physiological concomitants of social interaction is that social

adjustments are mutual, reciprocal control processes which have feedback repercussions affecting all levels of organization. The findings confirm the homeokinetic hypothesis of cybernetic learning theory that motor-sensory operations involve several parameters of physiological feedback which are related to maintaining energy for muscular contraction (K.U. Smith and T.J. Smith, 1970; T.J. Smith and K.U. Smith, 1985).

Human-Computer Interaction
as a Social Cybernetic Process

The digital computer has created the most revolutionary change in man's knowledge and thinking since the invention of writing. This invention and revolution conforms in detail to our claims of the role of technology, communication, and social organizational processes in evolution of cognitive operations, since the digital computer of today is operated as a problem-solving, decision-making, thinking machine, as a universal communication device, and as the first machine in history with which the operator interacts on a basis comparable to many complex social-tracking interactions. In the past three decades computer automation, computer communication, and computerized social tracking have revolutionized industry, commerce, finance, education, and medicine, and have created the base of a new science of human-computer interaction (T.I. Smith and K.U. Smith, 1988a).

The advent of the computer age and of computer communication between persons, groups, institutions, and nations, requires a thorough reappraisal of the allegedly scientific doctrines of communication as embodied in the statistical model and its derivative information and artificial intelligence dogmas. As we have noted, Shannon's (1948) information theory represents a bivariate analysis of communication that has critical limitations as applied to multivariate interactions—the pattern of most social and human-computer interactions in which learning, memory, adjustment to error, and varied cognitive and integrative transformations of information may occur. Experimental evidence discussed previously, regarding the motor behavioral basis of thought and memory, suggests that the computer-metaphor model of the brain as an information processor is highly speculative and lacks experimental substantiation of its theoretical claims. We believe that it is the lack of biological meaning of statistical communication and information-processing theories that has blunted the vaunted efforts of artificial intelligence theorists and practitioners to solve the problems of computerized vision, computer learning, automated language analysis, and indeed "artificial intelligence" generally. Modern cognitive science, in its assumptions that information-processing theory and computer psychoanalysis can reveal truths about the brain and about behavioral and human-computer communication, has defined its own decline and demise as a *bona fide* scientific discipline.

Instead of using the computer as a metaphor of brain and behavior, the approach that we have developed and advocated recently is to model human-computer interaction as a social cybernetic process, in which the computer is assumed to possess limited social tracking capabilities (T.J. Smith and K.U. Smith, 1988b, 1987b). The model assumes that during the operation of interactive human-computer systems, man and machine become linked as social partners in a mutual social tracking process. Ideally, this process entails mutual exchange and control of sensory feedback across the human-computer interface, comparable to the interpersonal social tracking depicted in Figure 7. The validity of the model rests upon the fact that, in a long line of human-machine-tool systems dating back to prehistory, the computer represents the first technological partner which realistically can be adaptively configured for integrated, multimodal control of sensory feedback.

Viewed from a social cybernetic perspective, today's interactive computer system stands as a relatively impoverished social tracking target for the human partner. That is, computer capabilities, both for tracking and controlling sensory feedback *from* the human partner, and for generating a rich mix of sensory feedback as tracking input *to* the human partner, are limited. One acute limitation is the essentially complete inability of computers to either generate or detect integrated movement patterns—as we have noted, movement control of sensory feedback forms the basis of social tracking among humans (Figure 7). An equally critical lack is the primitive capabilities of the computer in controlling sensory feedback from its own activities—such control forms the basis of human feedback guidance of behavior (Figure 1). For example, automated computer control of the dynamic response characteristics of its own sensors (such as dynamic range, sensitivity, timing, and/or spatial orientation), in accord with real time demands of the social tracking process, typically has not been implemented.

These machine social tracking limitations in turn create sensory feedback control problems for the human partner, by introducing sensory incompatibilities as well as spatial and temporal perturbations in machine sources of sensory feedback. For example, human social cognitive behavior is predicated largely upon use of vision and hearing to detect sensory feedback, and use of sound and movement to produce and control sensory feedback. Many interactive systems lack all of these modalities, forcing substantial cognitive compensation by the human partner.

We suggest that the social cybernetic model of human-computer interaction defines the nature and the challenge of human-computer interface design as a human factors problem. Under the rubric of information processing theory, the assumption is that human-computer interaction is mediated through the cognitive interface, distinct from the physical interface, based on data exchange between information structures residing in the computer and in the user's brain (Nickerson, 1986). However, under the social cybernetic model, user friendliness means an enriched and robust social tracking environment. Effective cognitive interaction is assumed to be mediated by motor behavioral control of sensory feedback, defined by the physical, human-factors features of interface design. From this point of view, the physical and the cognitive interface are one and the same, and the best way to improve human-computer interaction is to substantially enhance the social tracking capabilities of the machine partner.

Given the fundamental social tracking limitations of current interactive computer systems, it is no wonder that many users find sustained interaction with a computer to be an unappealing proposition. More generally, the social cybernetic model suggests why some users tend to view their computers as trusted, indispensable associates, while others, who may be constrained to work under stressful conditions with the machines, consider them as insidious mechanical agents of corporate authority. In subjecting computer-mediated social behavior to experimental analyses, we believe we have discovered the social ghost of the computer machine (rather than some disembodied ghost of the brain in the machine), which both repels and attracts different users and workers. Indeed, the results of experimental systems analyses of computer-mediated social behavior (previous section), suggest to us that spatial and temporal perturbations in sensory feedback produced by human-factors defects in computer systems design account for a large part of variability observed in human-computer interactive performance.

That this conclusion is not purely of academic interest is suggested by health, safety, and societal implications of the integration of interactive computer technology into the social framework of our society (T.J. Smith and K.U. Smith, 1988a). For example, the advent of office automation, in which social interaction with the computer is mediated principally by a

video display terminal, has created consternation among millions of workers, who complain of a spectrum of stress-related behavioral and physiological health problems related to continuous work at the terminals. The percentage of affected workers appears to be about one-third of the total number of VDT operators. Repeated studies, now extending over more than a decade (Salvendy, 1987), have failed to identify the specific source of this VDTitis. Our view is that VDT disorders have variable causes and origins related to generalized and specific stress-related decrements in cognitive motor performance, produced in a significant number of operators who unfortunately find that the touch/keyboard/CRT characteristics of the interactive system provide poorly designed social tracking conditions.

In a broader sense, poor social design of interactive automated systems now has the potential to threaten the fabric and health of society itself. Two recent reports by the U.S. Congressional Office of Technology Assessment indicate that an estimated 20 to 35 percent of all U.S. clerical workers currently are subjected to some form of automated electronic monitoring of work performance, and that stress-related illness costs U.S. business $50 to $75 billion annually (Booth, 1987). The suggestion of a cause-and-effect relationship in these statistics is compelling. Poor human-factors design of interactive, automated systems has been implicated in the Three Mile Island, KAL 007, and Chernobyl disasters, as well as the 1987 market crash, all of which have had major economic, political, and environmental impacts. Given the global consequences of such conditions and events, there can no longer be any reasonable doubt that the future course of industrial automation is critically dependent upon an improved human-factors understanding of the computer as a biosocial as well as a technological force in society.

The advent of the computer as a diversified communication and problem-solving machine, with which users can interact with the help of the programmer, software designer, and hardware engineer, crystallizes the significance of interactive concepts of communication. The machine is a novel type of device because it can be made to operate as a surrogate social partner. Computer automation is based on using the machine to mimic coordinate behavior and social interactions in our most significant societal and technological contexts, namely work, education, science, and communication. Accordingly, to achieve the most effective and safe levels of interactive performance, human-computer systems designs must be based on insight into the fundamental facts of the integrative feedback mechanisms of both individual and social behavior.

Evolution Cybernetics:
Feedback Control of Natural Selection

The cybernetic theory of evolutionary variation and natural selection assumes that the evolution of life on earth has been feedback controlled and feedback integrated by living organisms themselves. Adolph (1982) has described how feedback control and integration are characteristic of all biological systems, but has not indicated how the feedback concept applies to the evolutionary process that created these systems. This section fills this gap with an analysis of evolution as a feedback-controlled process, based on our previous publications on this topic (Smith, 1983, 1980a, 1980b, 1980c, 1980d, 1972c (Chap. V), 1966d, 1965a; K.U. Smith and M.F. Smith, 1966; K.U. Smith and T.J. Smith, 1968; T.J. Smith and K.U. Smith, 1978, 1974).

The assertion that natural selection is feedback controlled means that the process of evolution is determined by the evolving individuals and groups themselves. This viewpoint contrasts with the Darwinian and neoDarwinian dogma of open-loop environmental determination of selection in evolution. The fuel of evolution consists of variations in the adaptive

characteristics of organisms. Such adaptive variability may arise genotypically, through such well-recognized mechanisms as mutation or rearrangement, or phenotypically, by variations in gene expression during development (i.e., see Borst and Greaves, 1987). Cybernetic theory assumes that organisms feedback control variability at both levels, and thereby control their own selection.

To illustrate the concept of feedback control of developmental variability, we describe first how human evolution has been self-determined through biosocial feedback control of adaptation at the level of human development. This approach assumes that biosocial feedback mechanisms at the developmental level represent a critical mode of self-selective control, and that human evolution provides the strongest evidence for such control. Subsequently, we discuss briefly the more general question of feedback control of natural selection in phyletic evolution.

Systems Analysis of the Course and Levels of Human Evolution. In the behavioral cybernetic interpretation, self-regulated biosocial interactions at interpersonal, group, institutional, and civic (integrated urban, state, national, and global regulatory organization) levels of human organization have governed human evolutionary selection on a feedback basis. Individuals within these social patterns are selectively ordered both for survival and relative roles in adaptation primarily through interactive social feedback relationships during development. Phenotypic variability is assumed to be controlled by the interrelated physiological, behavioral, and social feedback influences upon gene expression and learning. Social structure and social dynamics within the family, community, village, city, urban industry, state, nation, and global systems all can influence individual development and thereby guide both variation and selection in evolution.

A systems survey of the anthropological and archeological data on human social and cultural evolution over the past two million years suggests that some nine distinct evolutionary stages have occurred in biosocial organization, work, technology, and the management of human society. These are illustrated in Figure 8. The emergence of these stages has been feedback integrated with evolutionary development of human thought capabilities, as discussed previously (Figure 5). We assume that human biosocial and biocultural development, whose stages persist today as primary cultural integrations of the interpersonal, group, institutional, and civic patterns of
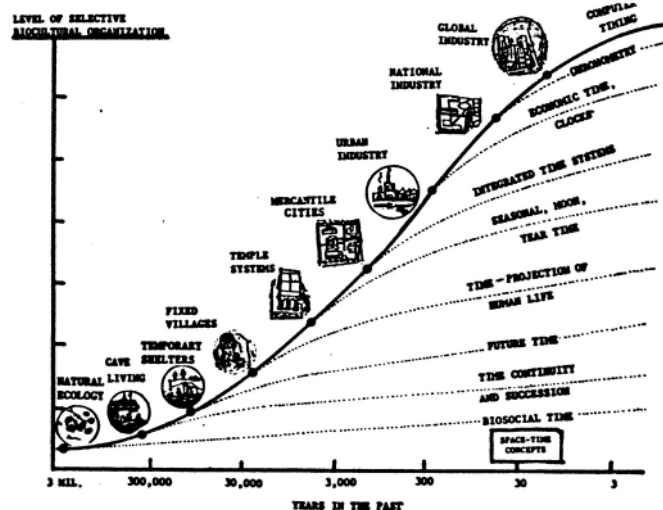
Figure 8. Cybernetic systems theory of biocultural evolution.

organization of social behavior, operates as the primary selective force in the continued guidance of human evolution. This is a feedback selective process, inasmuch as the biosocial and biocultural products of mankind's creative efforts to human factor the environment and the human condition have in turn acted as the principal selective influence on human evolution. Although others also have commented on the significance of culture and technology as human evolutionary catalysts (i.e., see Butzer, 1977), our focus on biosocial behavior as the underlying feedback control mechanism is original.

The artifacts and records which constitute the anthropological and archeological evidence of past human systems suggest that each stage of human evolutionary change consisted of interrelated reorganization and revised human-factors design of communication (language and cultural forms), tool/machine technology, architecture, and organizational management of existing levels of work and society. The stages of evolutionary change identified in Figure 8 are: (1) natural environment; (2) cave dwelling (temporary and permanent); (3) temporary settlements; (4) fixed villages; (5) temple (religious) regions and cities; (6) urban mercantile systems; (7) industrial towns and cities; (8) national industrial systems; and (9) global computerized industrial systems.

According to the view defined in Figure 8, architectural technology and its associated communicative, machine technology, and social organizational substrates, defined together the primary selective patterns of social organization, societal management, and control of human development at each level of biocultural evolution. The selective processes involved an overall feedback interaction between individual/social behavior and the human-designed ecological systems. The over all process of evolution was integrative and cumulative. As populations expanded, pressure for new biosocial levels of organization built up, leading to revision in the overall organization and management of society. As new levels of organization emerged at forefronts of the world system of society, older levels of organization persisted and evolved at a tempo defined by the dynamics of their behavioral/ecological patterning. In general, revisions in biosocial organization occurred at critical evolutionary forefronts, in which expanding populations were not constrained by established biosocial/ecological organization to persist in older conventional patterns of organization. The critical fact is that all of the fundamental patterns of biosocial/ecological revision of society which emerged in the past as forefront selective systems of biocultural organization persist today as selective feedback-controlled patterns of human factored development, ecology, and adaptation.

Technological Feedback Factors in Human Evolution. In the social cybernetic view, the human factors/ergonomic design of both biosocial organization (including interactive behavior, social groupings, communication, management of society, work) and technology have selectively guided the course of human evolution on a feedback basis. Inventions and changes in tools altered structure and function of the human body in use of tools as well as in communication, social interaction, thinking, and management of society, all of which fed back in turn to positively influence subsequent technological development. Figure 9 identifies 15 distinct stages of technological innovation which have been created in human evolution through this feedback process.
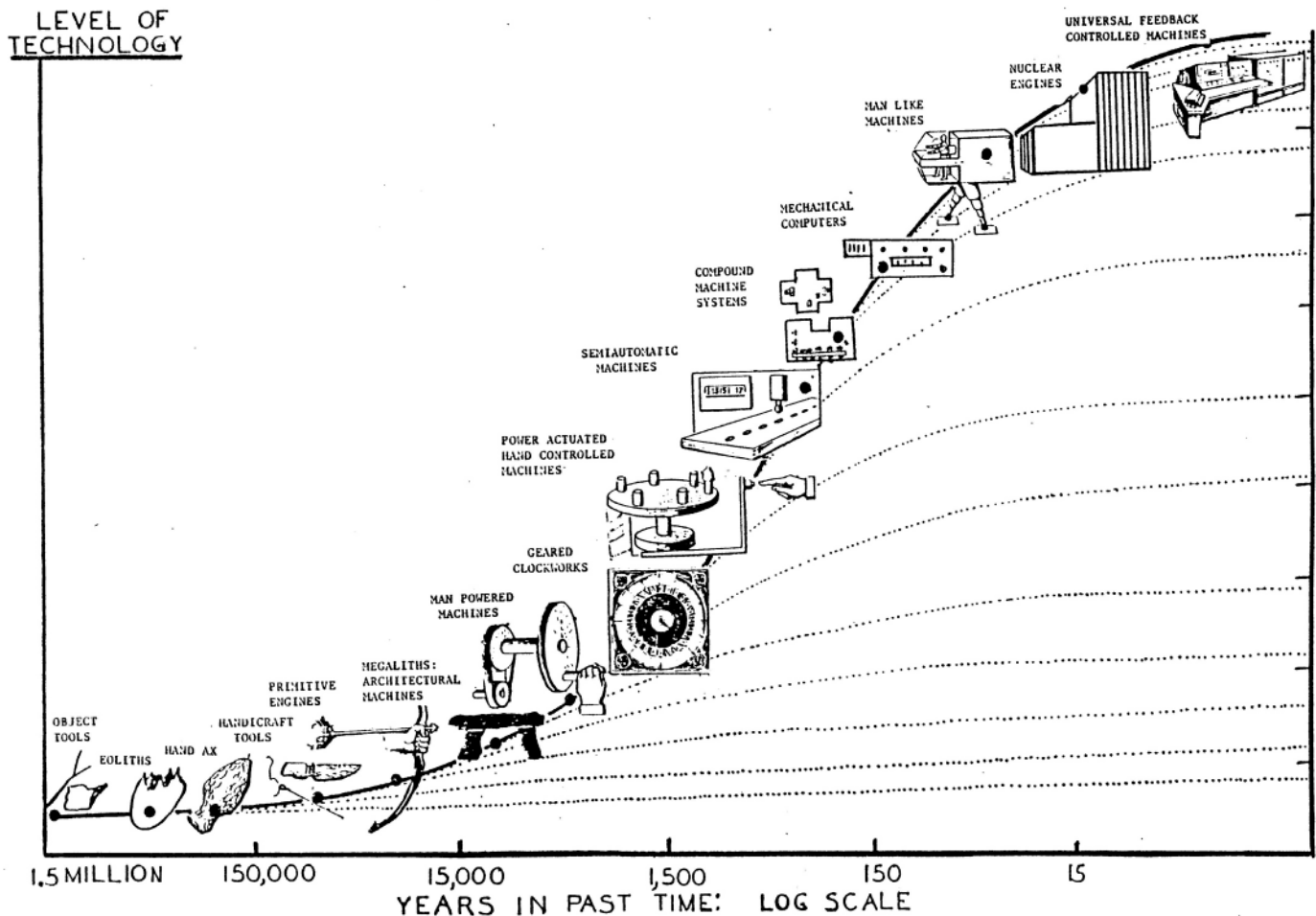
Figure 9. Cybernetic systems theory of the evolution of technology.

The illustration in Figure 9 is meant to suggest that the development of technology in society has been accumulative and integrative, leading to successively more complex machine systems and architecturally integrated systems of machines. As new tools, machines, and machine systems have been produced, older designs and types were not discarded, but continued to be developed and redesigned into more refined instruments and devices (Singer et al, 1954). The upshot is that today all of the human-factored technological creations of the past are still in use as the cutters, smashers, piercers, and levers of modern *Homo.* But overall, the processes of tool/machine development in evolution have been integrated continuously and closely with communication and architectural technology to increase and refine the scope of social interactive behavior and organization of people in work, recreation, education, religion, medicine, commerce, industry, and government. The computer epitomizes this process as the end product of millions of years of human evolution in the creation of socially relevant technology which can be used to mediate social interactions as well as to aid adaptation and productive work.

The systems representation in Figure 9 of the most likely course of evolutionary development of tool/machine technology supports the social cybernetic view that the invention and design of tools and machines have served as mediating influences, not primary determinants, in biosocial organization and ecological human designs in the course of evolution. As new tool and machine designs have been produced, human behavior, function, and structure have altered gradually in a self-governed manner in the use of technology. This in turn has fostered emergence of new behavioral and cognitive skills and practices in the design and invention of new levels of technology. During the course of civilization, science, education, and commercial/industrial technology have formed a feedback triad for generating new technology and applying it to all levels of organization. The most direct selective force of tool/machine technology upon biosocial organization and management of society at different levels of evolution has been in providing the instrumentation to mark, sense, tell, record, and project time, and to govern the feedback interactions of work and communication.

As Figure 9 suggests, a primary interacting feedback relationship between tool/machine technology and biosocial organization in evolution has been the creation of time symbolism and the technology of communication for the dynamic control and integration of biosocial organization. From the earliest ages of hominids, tools and tool-making have had temporal significance. To design and make tools involved the temporal projection and prediction of the designs for particular uses. The early tools of *Homo sapiens* were used to mark and track time. The first human-made shelters were designed and used to track the changes in the position of the sun. According to Lockyer (1894) and Penrose (1893), all the magnificent temples and tombs of beginning civilization in Egypt and Greece had temporal significance in tracking the sun, moon, and stars, as symbols of temporal as well as religious and secular authority, and as media for recording and representing events in historical time. The first uses of writing were in recording events of the Pharaoh's life. The first geared machines of society were clocks, not industrial production machines. The first massive monumental architectural structures of Western society were not forts and palaces of kings, but cathedrals and churches, all of which had temporal significance and symbolism in representing the past, present, and future life of man—i.e., biosocial organization on a projected time scale.

Machine industry, including that of the computer, has had a temporal biosocial design component in pacing and regulating the organizational management of work as well as in providing the technology for protection, fabrication, and control and transmission of power. Figure 9 illustrates these temporal-biosocial implications of the evolution of technology by indicating the time concepts, symbolism, and time-related communicative processes which have accompanied the evolution of tools and machines.

Support for the cybernetic formulation of the evolutionary stages of biocultural organization and technological change, as shown in Figures 8 and 9, goes beyond the existence of artifacts, records, and remains indicating that such hominid systems existed at particular times. Other evidence is provided by the harmony of this interpretation with other estimates of human evolutionary change. For example, the times indicated roughly in Figure 8 for successive biosocial reorganizations of society correspond with expectancies of the von Foerster (1960) and Meyer (1983) formulations of world population increase. The period changes indicated in Figure 8 also harmonize with Calhoun's (1970) estimate of the relationships between the doubling of world population and the corresponding doubling of human capacities and phase shifts in cultural organizations.

Selective Behavioral Mechanisms of Social Feedback. In the social cybernetic interpretation, the primary selective mechanism of behavior consists of mutual, interactive, feedback-controlled relationships between individuals in communication and social psychomotor activity, which we have designated by the term social tracking (Figure 7). The assumption is that the scope of human systems control embodied in social tracking, made possible by its many different sensory modes, patterns of communication and interaction, and feedback conditions (as suggested in Figure 7), constitutes the selective framework of human development and evolution. Previous discussion has applied this interpretation both to cognitive development and evolution (Figures 4 and 5), and to biocultural and technological evolution (Figures 8 and 9), in terms of their selective guidance by means of social tracking control mechanisms.

A number of arguments can be raised in support of the hypothesis that social tracking represents the basis of feedback selection in human evolution. The first is that the social-tracking concept also has direct relevance to animal adaptation and evolution. There is substantial evidence that the ubiquitous, dynamic, social interactions of specific animal phyla and groups, in colonizing, swarming, schooling, flocking, herding, aggregating, mating, nesting, migrating, communicating, mimicking, homing, and forming family groups, prides, territories, congregations, and communities, constitute specific patterns and modes of animal social tracking. There also is direct evidence (Smith, 1987) that these animal social-tracking modes and their feedback mechanisms and patterns act as the primary selective mechanism governing the success of ontogenetic development by individuals within species.

Accordingly, from this evidence it may be argued that social tracking mechanisms govern selection in both phyletic and human evolution on a feedback basis. Indeed, this argument can be advanced strictly within the context of conventional evolutionary theory. The modern synthetic theory of evolution contains two key assumptions regarding mechanism, first that differential reproductive success is the target of natural selection, and secondly, that selection can also operate at the species level (Crews and Moore, 1986; Gould, 1982). We observe that both reproduction and species individuality are feedback defined by social tracking activity. In fact, recent reports have implicated both sexual behavior (Lovejoy, 1981) and nutrition (Frisch, 1977) as significant determinants of human reproductive success. Food and sex, two of life's essential requisites, are both achieved primarily through social tracking. As for species selection, the cardinal characteristic of a species is that "most (species) function as entities in nature, with coherence and stability" (Gould, 1982, p. 384). Such coherence and stability is established and sustained through social tracking mechanisms.

A second argument is that social tracking has physiological feedback effects, and therefore has selective physiological influences in evolution. We have earlier cited extensive experimental evidence (also see Smith and Smith, 1987a)

which indicates that social behavioral tracking evokes compliant physiological tracking patterns in cardiorespiratory, neuromotor, neuroendocrine, and metabolic functions among the interacting partners.

Yet another argument for the selective role of social tracking is the critical role of social tracking in family life in guiding human development. Many different television and computerized social feedback experiments (Smith, 1987) have provided results which suggest that the course of development of infants, children, and adolescents is strongly associated with critical advances in social tracking skills in the visual, tactual, and auditory domains. The experiments also disclose that infant and child development generally is dependent upon and organized around emergence and acquisition of social tracking skills in both communicative and psychomotor behavior (K.U. Smith and M.F. Smith, 1966).

A final argument for the validity of the social tracking theory of evolutionary selection is provided by human development of the computer as a universal social tracking device. The most recent stage in the evolution of social organization and management of society and technology is that defined by the computer revolution and the computer age (Figures 8 and 9). Computer products and computer-related business, communication, educational, office, medical, and manufacturing systems and services now account for the predominant productive, economic, and occupational exchanges of society. The automation of society involves computerized mediation of a wide variety of social-tracking interactions among people and between people and machines.

The modern computer is the current end product of a long line of technological inventions serving the cause of biosocial tracking. As such, today's computer acts as a surrogate social partner for the operator in both occupational and non-occupational settings. The applications of human-computer interaction thus recapitulate a number of specific patterns of interpersonal and group social tracking, such as: (1) monitoring and control of persons; (2) information exchange; (3) mutual problem solving; (4) joint control of machines and processes; (5) training relationships; (6) social aiding in disability; and (7) machine control of social functions. This technological integration of the computer into the biosocial fabric of our society tends to support the view that it is selective social tracking and its feedback mechanisms which guide both human development and evolution (Smith and Smith, 1988a).

Feedback Control of Phyletic Evolution. Nearly 14 decades have now elapsed since Darwin published his treatise on the origin of species. During this period, changes have occurred in the standard scientific interpretation of evolution, relative to Darwin's original theory. To explain evolution, Darwin's theory emphasized the concepts of differential reproductive success of individual organisms as the medium of selection (microevolution), and of gradual, random, undirected production of large numbers of genetic variants as providing the creative material for selection (gradualism). In the "modern synthetic theory" of evolution, these original themes have been extended (Gould, 1982; Stebbins and Ayala, 1981) to incorporate newer evidence regarding: (1) the chemical nature of the gene as DNA and the molecular biology of genetic variation; (2) natural selection at the species level (macroevolution); and (3) uneven rates of evolutionary change (punctuated equilibrium), instead of pure gradualism. Evidence for neutral mutation and random genetic drift as a nonDarwinian mechanism of evolution also has been advanced (King and Jukes, 1969).

Dramatic advances in biological science also have occurred in the last fourteen decades. For our purposes, among the most significant are findings indicating that physiological, organ and tissue, cellular, and molecular activities in the organism all are under closed-loop control (Adolph, 1982). In particular, all activities involving the gene and genetic expression—transcription, translation, replication, recombination, repression,

activation, and so forth—have been shown experimentally to be under feedback control. Of special note is the fact that the high fidelity of DNA replication, and the repair of DNA damage, is mediated by feedback mechanisms (Badman and Wagner, 1988). All genetic feedback control is based on proteins, the molecular controllers of the cell, which have specificity for DNA binding, DNA and RNA synthesis, DNA repair, and so forth. This body of evidence, coupled with evidence supporting behavioral feedback, support the general conclusion that life in all of its manifestations is a cybernetic process.

In this revolution in scientific understanding of the cybernetic nature of life, one area of biology has remained immune. The dogma of environmental determinism as the mechanism of natural selection remains an article of faith among contemporary evolutionists, just as Darwin first proclaimed (Gould, 1982). The concept of environmental, or Darwinian, selection is seductive in its simplicity and its generality. It can be used to account for practically any trend or change in living processes, and is almost impossible to disprove. The conventional wisdom is that the doctrine of environmental selection explains the evolution of all forms and attributes of life on earth, including animal and human behavior (Mayr, 1974). In addition to evolution, the doctrine also has been used to explain such widely disparate processes as human and animal learning (already discussed), business management (social Darwinism) and human economic behavior (Smith, 1965a, 1962b; Taylor, 1911), human history (Durant and Durant, 1968; Toynbee, 1972), social behavior (Homans, 1974), and the immune response (Burnet, 1959).

Our viewpoint on the validity of environmental selection doctrine, as applied to living systems, is clear and unequivocal. It is wrong. It contradicts everything we know today about the cybernetic nature of life, it defies objective, experimental analysis, and it is therefore void of any significant scientific meaning. Cybernetic theory advocates an alternative interpretation of phyletic evolution as a self-determined, feedback-controlled process, based on the following specific postulates.

1. All living systems actively control their environment.
2. Environmental control is mediated by a hierarchy of closed-loop feedback and feedforward control mechanisms.
3. Whether or not a system survives, develops, and reproduces is a function of its competency in controlling its environment.
4. Competency in environmental control is defined by the constellation of feedback mechanisms with which a system is imbued. In animal species, control of the environment is mediated primarily by behavioral cybernetic mechanisms. These involve motor control of sensory feedback by the individual to guide development, learning, cognition, and physiological and cellular integration, and social tracking at the species level to feedback control species integrity.
5. By virtue of their own self-regulatory capabilities for environmental control, living systems select themselves in evolution. This is the doctrine of feedback selection. Evolution is a cybernetic process.
6. As feedback control is hierarchical, so feedback selection is hierarchical. The process involves feedback between environmental variability and phenotypic and genotypic diversity, such that the genotype and derivative phenotype become customized for effectively tracking and controlling the particular set of environmental contingencies confronting the system. This is the doctrine of feedback adaptation. Genotypic customization is mediated by directed mutation, and by directed expression of randomly mutated genotypes, both under phenotypic feedback control.

The crux of evolutionary feedback theory, therefore, is that in the course of tracking and controlling their environment, living systems feedback control their own phenotypic adaptation and thereby their own genotypic selection. Experimental evidence supporting this theory is available. The assumption

that evolutionary progression and regulatory sophistication are feedback related is supported by indications that the evolution of the regulatory genome may underlie the rapid development of major animal groups (Valentine and Campbell, 1975). Evidence that, relative to humans, lower animals cannot as effectively control spatial perturbations in sensory feedback also is germane (reviewed by K.U. Smith and W.M. Smith, 1962). The work of Greene and Smith (1963), showing that human abilities in controlling such perturbations only mature in the late teens, suggests an ontogenetic recapitulation of this phylogenetic trend.

The concept of directed control of genotypic variation also has experimental support. Confronted with environmental extremes and under apparent phenotypic feedback control, corn (maize) initiates a process of directed mutational change, generated by transposable elements and subsequently inherited, which enables the plant to rapidly adapt to (and thus control) new conditions (Wessler, 1988). And directed mutational change, enabling rapid adaptation to a new carbon source, recently has been demonstrated in bacteria, with a distinctly cybernetic interpretation (Lewin, 1988): "...in bacteria there can be very rapid feedback between exposure to a new environment, expression of a favorable protein, and permanent genetic change: it is a feedback between chemicals in the environment and enzymes required to process them."

The immune response exemplifies a third case of genotypic adaptation now understood as cybernetic rather than Darwinian in nature. The original clonal selection theory of Burnet (1959) assumed that antigen controlled the proliferation of lymphocytes (B cells) producing antibody specific for that antigen, a classic idea of Darwinian environmental selection. It is now known that the immunocompetent organism maintains a repertoire of resting B cells, each of which has a different antigen specificity as a result of multiple elements, combinatorial shuffling, and hypermutation of genes coding for antibody (Alt, Blackwell, and Yancopoulos, 1987). When the organism is challenged with antigen that matches the specificity of one of these cells, that cell undergoes clonal proliferation via the following mechanism (Miyajima, et al., 1988):

> The formation of antibodies by an animal after exposure to antigen involves multiple cellular interactions. At the beginning, antigen processed by antigen-presenting cells is recognized by a T (thymus-derived) cell antigen receptor. At the end, B cells produce antibodies that have the ability to recognize the antigen that provoked their formation. In between the two antigen-specific events, T cells help B cells to make antibody by producing lymphokines... helper T cells can be regarded as a signal transduction machine that receives antigen-specific signals and converts them into antigen-nonspecific mediators of the immune response.

The immune response thus involves an orchestrated series of events in which a specific environmental challenge is controlled through feedback selection and propagation of one genotypic/phenotypic combination out of many. It is the cells of the immune system themselves, not antigens, that mediate this orchestration to self-control the system response. When the immunocompetency of the organism in controlling the antigenic environment is compromised, infection, cancer, or AIDS may result.

Our cybernetic interpretation of phyletic evolution is advanced with the objective of reforming and updating, not overturning, the modern synthesis and its Darwinian antecedents. There can be no doubt regarding the evolutionary significance of the themes of individual and species selection, based on differential reproductive success. However, differential reproductive success is a highly simplistic description for a process which actually involves feedback-integrated molecular, cellular, physiological, behavioral, and social tracking at the individual and species levels, based on an intricate set of hierarchically organized feedback relationships. Furthermore, as others have also observed, the concept of differential reproductive success when equated with fitness is essentially tautological, and therefore meaningless, as an explanatory mechanism for evolution. In cybernetic terms, evolution can be considered as a control objective of the set of feedback mechanisms that integrate reproduction with all other systems activities.

One important prediction from a control theory of evolution is that the level of variability in system evolutionary strategies should be comparable to the level of variability in system control strategies. Given the evident diversity of the latter, evolutionary mechanisms also should be highly customized at the individual and species levels. If so, the raging debates over what mode of evolution has occurred in the past become moot. Evolution has involved the concurrent action of many different modes and mechanisms of change, which cannot be predicted by any generalized model. The particular evolutionary strategy invoked depends upon the control characteristics and capabilities of the individual and the species, relative to the particular set of environmental conditions which must be controlled. This conclusion calls into question the scientific utility of the generalized mathematical models of evolution, like those developed by Fisher and Wright, based as they are on such assumptions as randomness or gradualism in evolutionary change.

Our most important objective in introducing and advocating a control theory of evolution is to confront the doctrine of environmental selection. Environmental determinism in any form is a scourge to clear scientific thinking about how living organisms actually operate as cybernetic systems. The assumption that a living system, which in all other respects self-controls its own existence, its own organization, and its own functions, nevertheless can be selected in evolution by some abstract environmental force strikes us as an absolutely ludicrous and preposterous scientific concept. Darwin's place in history is assured. It is not his scientific reputation, but that of his contemporary acolytes, that is sullied by continued, stubborn adherence to an outmoded concept. Now is the time for serious students of evolution to bring their field into the 20th century, and to begin the process of conceptual and experimental analysis of feedback mechanisms governing evolutionary change.

In the context of evolutionary control, it seems appropriate to close this report by addressing the general question of teleology in biological systems, a topic with philosophical as well as scientific overtones, and one that has been discussed in past CC issues. In the philosophical sense, the purpose of life on earth has been of central concern to genus *Homo* throughout history and much of prehistory, given the obvious religious and secular connotations of mortality and destiny surrounding the question. In the scientific sense, a somewhat related question is whether apparent purposive behavior or activity by a living system indicates implicit or explicit striving towards an anticipated goal. The teleological answer to this question has its origins in vitalism, which assumed that such purposive behavior could not be explained in purely mechanistic terms. From a behavioral cybernetic standpoint, the concepts of purposive behavior and teleology are products of the unique human cognitive capabilities for conceiving and controlling time, and for projecting time into the future. Purposive behavior is mediated by feedback control mechanisms, and the objective is control of prevailing and projected conditions in the internal and external environments. No non-human organisms have a well-developed sense of their own purposefulness, but all organisms continuously control their environments as an essential requisite of existence. From this perspective, life and environmental control are synonymous, and the concept of teleology can be dismissed as biologically and scientifically irrelevant. The key questions that should be addressed, in interpreting any biological phenomenon, are what environmental conditions are being controlled, and what are the mechanisms of control.

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Comments on "Behavioral Cybernetics" Are Invited

Please send your comments on the Smiths' work to *CC* for publication in an upcoming issue. The deadline (to allow for responses by the Smiths) is March 1, 1989.

Continuing the Conversation

c/o HortIdeas
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IF YOUR ADDRESS IS CIRCLED IN RED, PLEASE RENEW IMMEDIATELY. NO SEPARATE RENEWAL NOTICE WILL BE SENT!

Continuing the Conversation

A Newsletter of
Ideas in Cybernetics

An Issue of Reflections

This issue includes reflections on *CC* #15 ("The Cybernetic Basis of Human Behavior and Performance"), by several readers; reflections on the Fall 1988 American Society for Cybernetics "Texts in Cybernetic Theory" Conference, by five individuals who participated in that conference; reflections on "guest-ages" for subverting the arms race, by Robert Flannery; reflections on an earlier conversation in *CC* about control theory, by Richard Marken; and reflections on life, by "R. Lori." Continuing conversation on any and all of these topics (especially life!) is welcome... deadline for CC #17 is June 1st.

In re "Behavioral Cybernetics"...

About three dozen *CC* subscribers, selected by the editor, received special invitations (some called them imperatives) to comment on "behavioral cybernetics," as summarized in *CC* #15 by Thomas J. and Karl U. Smith. The invitations read, in part, as follows: "So—as *you* see it—what's significant, insignificant, relevant, and irrelevant about "behavioral cybernetics" as related to "mainstream cybernetics"? Should (at least some) ASC members be paying more attention to the Smiths? Do you get any deep insights upon reading CC #15? Whether you think this stuff is wonderful or a dud, please feel free to say so (and why you think so, of course)."

Eight commentaries were received in time for inclusion in this issue of *CC*. The Smiths will have the opportunity to present a rejoinder in a future issue. As usual, comments on the comments (and comments on the comments on the comments) are invited.

When Self-Regulation is Not Regulation by a Self (or the Tortuous Career of Naturalistic Behavioral Control)

By Dennis J. Delprato (Dept. of Psychology, Eastern Michigan University, Ypsilanti, MI 48197). Copyright 1989 by Dennis J. Delprato.

The Smiths' behavioral cybernetics (Smith & Smith, 1988) is an impressive contribution to one of the more remarkable messages of the cybernetic movement, i.e., behavioral control is not a matter of subsequent responses or movements of organisms generated by prior external conditions or extruded by a previous internal cryptopower such as a self. Instead, behavioral control is always maintained via simultaneous mutual interactions of intrasystemic relations operating in real time. In this way, behavioral control is properly referred to as self-control with no implications of a substantive self.

How will cybernetic behavioral control ever become incorporated into biobehavioral science? I foresee that there will be three interrelated routes. Two routes are research-oriented and data-based. The third involves historical analysis and theoretical integration. The Smiths' behavioral cybernetics exemplifies one of the two research routes. They summarize mounds of empirically-oriented, controlled research that yield findings consistent with the cybernetic account of behavioral control. Work such as this is indispensable if feedback-control is ever to be taken seriously in behavior theory. But what of the minimal impression to date of behavioral cybernetics? To this critic, the problem is not one of poor methods, limited findings, or any other factor endemic to the Smiths' research. Instead, I suggest that, given the gravity of the task at hand, behavioral cybernetics must be supplemented by incorporation of the other two routes alluded to above.

The second of the research-oriented routes to cybernetic behavioral regulation is one of developing quantitative models and testing predictions derived therefrom. Work along this line is progressing nicely, as exemplified by Powers' control system model of tracking (e.g., Bourbon, in press; Powers, 1978) and Bullock and Grossberg's (1988) vector-integration-to-endpoint model of arm movements. Rather than offering an alternative to the strategy and tactics of behavioral cybernetics, cybernetic modeling combines with behavioral cybernetics to provide some of the grist for the mill of a third route to cybernetic self-regulation.

The experimentally-generated data of the Smiths and the modeling research have not yet had more than a minuscule impact on thinking regarding behavioral control (e.g., Delprato, in press). Unfortunately, data do not directly confront a formidable impediment to fresh ideas in the form of the heavy hand of cultural tradition and the logic of science it engenders (Kantor, 1953, 1959). Naturalistic self-regulation of human behavior directly conflicts with centuries of demotic and institutionalized views that treat human behavior as either fundamentally unamenable to naturalistic understanding or as the material concomitant of causal spiritual forces in one form or another of material-spiritual dualism, including the popular version exhibited in the nineteenth-century mechanistic and materialistic model of science. It is this tradition that makes the career of naturalistic behavioral control so tortuous. Insofar as data do not speak, it is not surprising that findings in contradiction of cultural tradition would be at times ignored, interpreted to correspond with the status quo at others, and downright excoriated at yet other times. To put it simply, one cannot force data into a science. Perhaps the only solution to gaining admission of truly novel ideas with sound empirical support into a science is to remove cultural obstacles by "critically analyzing the logic (systematics) of science and examining the sources of intellectual institutions" (Kantor, 1959, p. viii). Once historical and cultural impediments to a naturalistic idea are nullified by sound historical analysis and theoretical work, then interpretations can be more in line with the outcomes of research. Fortunately, Kantor and others (for a sampling, see Delprato, in press) have already progressed along this third route by (a) exposing the cultural origins of nonnaturalistic

dualisms and (b) tracing the evolution of scientific thinking through stages that include substantive thinking, then mechanism and materialism, ending with an integrated-field/system perspective. The availability of data, such as those from behavioral cybernetics and cybernetic modeling, will undoubtedly make smoother the historical scrutiny and theoretical analysis of happenings and issues that must be addressed if we are to have a naturalistic account of behavioral control.

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Please Spread the Word

By Philip J. Runkel (610 Kingswood Ave., Eugene, OR 97405). Copyright 1989 by Philip J. Runkel.

Dear Editor Williams:

I am happy to learn from the article by the Smiths in *CC* #15 about their grand program of research, running now for three decades and conducted by them, other members of their family, students, and others. I was gratified to read the Smiths' conviction, repeated and insistent, that control via feedback is the indispensable feature of living creatures, appearing not only in the behavior of the whole creature, but at every level from the cell to the evolution of species. I was glad to learn of the large body of research backing up, in one way or another, that conviction. I was glad to see, too, that the Smiths care about the welfare of their fellow humans; their concern came across in their speculations about social and societal life, in the fact of their work on human development and rehabilitation, and in their care to serve as subjects in potentially dangerous experiments before asking others to do so.

I was grateful to come upon two small bits of humor in their otherwise sobersided article: the note on page 8 about the way *Psychological Abstracts* classifies feedback and the delightful quip on page 11 about psychoanalyzing the digital computer.

I thought their comments on the history of psychology were keen and proper; I admired particularly their remarks about mentalism on pages 8 and 11 and about cognitive psychology on page 11. I was glad to see their insistence on page 14

that sampling behavior several times a second is necessary to understand the functioning of feedback. Their views on page 19 fit mine about reward and punishment and about the "statistical" theory of communication. Their explanation on pages 20-21 of the relationship between human and computer is the most cogent I have seen. We all should certainly heed their warnings about it.

The thing I missed most in the Smiths' article was a discussion of modeling. They did not say they had done any, nor did they propose any. I mean modeling in the sense that Powers, Marken, and Bourbon do it: programming a computer so that it controls its "perception" in the same way the living creature seems to do. Modeling not only tests theory quantitatively, but it also furnishes the clearest "language" I can conceive for communication among researchers. It is much easier to decide the match between working models than to decide the match between strings of words. It is much easier to decide the match between human behavior and a working model of it than between human behavior and evidence that (to use words common in research reports in my field) "supports" a theory, "indicates" it, is "consistent" with it, or (in the Smiths' words) "appears to directly substantiate" it.

The Smiths' portrayal of the relation between human and computer as a social one reminded me once again how eagerly I wait for someone to build feedback circuits into a computer—circuits that would show more general capabilities than the relatively simple programs so far built by Powers, Marken, and Bourbon, those that guide automated equipment in factories, or even those that keep cameras pointed at planets and moons. I am surprised it has not happened yet—to my knowledge. We have lots of machines containing feedback circuits, including the marvelous artificial pterosaur that maintained flight by flapping its wings in the natural, windy atmosphere and, as I understand it, crashed only because it had a weak neck. How marvelous it would be to have a conversation with a computer who had high-level internal standards and about whose predilections we could learn just as we learn about those of humans. It would be nice even to have a word-processing program with a personality.

I am grateful to you, Greg, for putting the Smiths' piece into *CC.* I am grateful to the Smiths, too, for taking the trouble to write it, despite the resentment they seem to feel at not being recognized by others who contribute to *CC.* Were it not for their article, I might never have learned about their work. The *American Journal of Physical Medicine,* the *Journal of Speech and Hearing Research,* and the publications of the American Society of Mechanical Engineers are about as far from my usual haunts as Tanzania.

I thank you too, Greg, for requesting (demanding?) that I read the article. Had you not done so, I probably would have given up after choking on the first three or four pages. Phrases such as "aspects... are human factored" (page 3) and "the emergence... has been feedback integrated" (page 21) left me wondering what they meant. They also left me sorrowing for the English language. I never figured out, either, what the Smiths meant by "compliant," "displaced," "social tracking," and "define." I can forgive them for their close-packed sentences filled with physiological terms that do not roll easily off my tongue, since they wanted to pack an account of three decades of work into one issue of *CC.*

I would be grateful if the Smiths would send a note for the next issue of CC recommending one or two books or three or four articles, or both, that could serve as an introduction to their manner of research—or of demonstrating feedback—and could be read with reasonable ease by those of us not familiar with the kind of language human-factors people use with one another. I would also be grateful, though I know it is asking a lot, if the Smiths would write some articles for the journals of the American Psychological Association or even those of

the American Educational Research Association. I would very much like to see statements such as those on pages 2-4 and 11 in the *American Psychologist.* I see that they sent one or two articles to the APA, but those were very specialized and had titles that would not have told me they were about feedback. I noticed, too, one article that went to the *Educational Technology Journal,* and that one had "feedback" in the title. That's good. I would certainly like to see news of the Smiths' work spread more widely.

At Last, Serious Dialogue on Cybernetics

By Richard J. Robertson (Dept. of Psychology, Northeastern Illinois University, 5500 N. St. Louis, Chicago, IL 60625). Copyright 1989 by Richard J. Robertson.

First, I was positively thrilled—with both the content and the fact that the lab which K.U. Smith had founded during WWII had survived and produced the volume of work described in the article by him and his son.

I had gotten the 1966 book, *Cybernetic Principles of Learning and Educational Design,* and had eagerly looked for a converging of the work of that lab and the work of the group beginning to form around the 1960 publications of Powers, Clark, and McFarland, in which I counted myself.

I saw each group as having a separate and complimentary role. Smith's work excited me with its imaginative, direct feedback analysis of many levels and kinds of behavior, and the immediate practical applications they suggested. However, it lacked—for me—the comprehensive, hierarchical, theoretical model I found in Powers' scheme. I fully expected each group to discover the other, but, alas, it never happened—(may I say?) until now.

Apparently, I looked in the wrong places for further work of the Wisconsin lab—I looked in leading journals of the American Psychological Association, where it should have been appearing. At that time, I had not yet heard of Thomas Kuhn's theory of scientific revolutions, and in my naivete I concluded, when I failed to find further work where I expected it, that Smith's lab must have been a flash in the pan. I already had the precedent of seeing the lab of McFarland and Clark in Chicago killed by a department-chief psychiatrist who couldn't comprehend what they were doing.

It seems clear now that the Smiths' work must often have been suppressed from the journals in which it should have appeared, just as was happening to the work of the Control Systems Group, by the gatekeepers of the tired S-R orthodoxy, who still today keep turning out the garbage that occludes the arteries of scientific communication in psychology.

I feel somewhat embarrassed by having to acknowledge my own lack of persistence in pursuing the exciting leads I found in Smith's 1966 book, but as I said, it was because I was eagerly following another branch of feedback control behavior theory. I certainly can sympathize with the hurt feelings expressed by the Smiths when they wrote (p. 8), "One of the few contemporary psychologists to also advocate a feedback doctrine of behavior... undermines the credibility of his arguments by completely ignoring the behavioral cybernetic contributions of K.U. Smith..." Obviously the Smiths don't know that Powers is *not* a psychologist, but a theory builder who concentrated on creating a model and left the citations and applications to those of us who *are* psychologists. (And I did cite K.U. Smith in my 1984 *Encyclopedia of Psychology* article on Control Theory.)

I also must add, on the critical side, that the Smiths' contributions—while powerfully convincing of the *fact* of behavior as the control of perception, and also extremely important in

demonstrating the disastrous consequences of interference with feedback in all kinds of practical situations—seem to me to depend too much on metaphorical explanations in place of a theoretical model, as compared to the *mechanisms* that Powers has been so carefully teasing out. I will give just one illustration. Where the Smiths wrote (p. 9), "We endorse the behavioral feedback viewpoint of Powers, but his concept is not new and his treatment of the supporting evidence is incomplete," I want to point out that so far as I can determine, *only* Powers solved the problem of how you can have an interlocking hierarchy of control systems (by having the reference signal(s) of the "lower" system(s) *be* the output(s) of the "higher" system(s)). For all their important contributions, neither Norbert Wiener, Ross Ashby, nor K.U. Smith came up with a resolution of this obstacle to building a plausible, comprehensive, hierarchical model of the organism.

Even non-cybernetic psychologists—including many S-R "theorists," as well as Abraham Maslow, Jean Piaget, and Erik Erikson—have observed hierarchical features in human behavior. But Powers is the only one who showed how such a control hierarchy could actually be built, neurologically or electronically. Likewise, it is Powers who led the way in building simulation models that produce data curves essentially identical to those produced by human performance-

So I conclude that the future of psychology needs both Powers' and Smiths' approaches, and I hope to see a marriage of them. At last it appears that followers of the two approaches might be in a position to have some real fun with each other, instead of agonizing about trying to explain behavior as the control of perception to people too entrenched or too lazy to be interested in the revolutionary implications of this new idea. What I mean by having fun is that there are various specific points in the Smiths' article which I think are subject to experimental debate—a debate about details, among those who accept the same fundamental paradigm. This could lead to the kind of cooperative competition to get the mechanisms just right that makes the natural sciences so exciting currently. What a relief it would be to dispute the interpretation of an experiment with someone who didn't need first to be convinced as to why it was worth doing at all!

Problems with the Smiths

By William T. Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1989 by W.T. Powers.

T.J. and K.U. Smith have been interested in feedback phenomena for thirty years and deserve a place among the pioneers in this field. Their Winter 1988 issue of *CC* seems excessively self-laudatory, but I trust that we are seeing a son praising his father's work more than two authors patting each other on the back, Escher-wise. When everybody is related, things get a little confusing.

There's one point I should clear up before getting to the important issues. The Smiths complain that I undermine the credibility of my arguments by completely ignoring their contributions in the 12 years before my *Science* article in 1973, which they appear to think was my first publication on this subject. In particular, they seem unaware of the 1960 paper published by myself, R.K. Clark, and R.L. McFarland, after a seven-year collaboration. This paper laid out all the basic principles of the model that I still use, and anticipated all the concepts to which the Smiths appear to be laying claim—at least those that are in agreement with those principles. The paper first appeared in *Perceptual and Motor Skills* in two parts; both parts were reprinted the same year, 1960, in *General Systems,* and Part I was reprinted in 1966 by A. G. Smith (no relation, I presume) in his *Communication and Culture.* 0. Hobart

Mowrer called attention to our work: a multi-page discussion in his *Learning Theory and the Symbolic Processes,* published in 1960, based on discussions with us in prior years. I refuse to be chided for not citing ideas that someone else reinvented after our team thought them up (whatever parts weren't adopted from others before us) and duly published them.

Now to the main issues. On the positive side, the Smiths were certainly pioneers in exploring the effects of alterations in the external feedback path, the effects of delayed auditory feedback being one of their most dramatic discoveries. They have gone on to explore many other kinds of manipulations of the feedback path involving visual and kinesthetic control. The wide variety of phenomena they have investigated has produced techniques and data that could lead in interesting directions.

We have to separate the Smiths' work into two categories: their experimental explorations of feedback phenomena, and their theoretical explanations of the phenomena. Their experimental work seems to have been aimed primarily at demonstrating that feedback is a fundamental feature of behavior. Aside from the introduction of this new consideration, however, the experiments seem to be organized around the conventional conception of scientific method: vary some condition and look for its effects on other measures of behavior, such as accuracy of performance and difficulty of relearning—Judging from their Table 1, the main manipulations consisted of inversion, reversal, inversion-reversal, displacement, and delay or intermittence in the feedback path. The main results noted are called performance decrements. I would certainly agree with the main inference that the Smiths draw from this work: "... behavior is guided continuously as a dynamic, feedback-controlled process." That was the concept put forth by Norbert Wiener in 1948 that drew me (in 1953) into this field—But there are much better and more direct methods for establishing that control is present, methods that not only settle that question but tell us the quantitative properties of the control system in question. As far as I can tell, the Smiths never measured the properties of control behavior with a normal feedback path and never tried to use such measurements as the basis for predicting what would happen when the feedback parameters were changed—By this I do not mean they never observed normal behavior: I mean that they did not measure any of the properties peculiar to control systems such as loop gain or reference level. In order to do such things, they would have had to offer a quantitative model of control behavior, which as far as I can see they have not done.

The Smiths seem to be addressing their theoretical statements to people who are unconvinced that a real system can behave this way; that is, to conventional behavioral scientists. The evidence they cite is circumstantial and fragmentary, although voluminous. It is also treated in an undisciplined way; most of their paper looks more like a brainstorming session than a systematic attempt to understand how the phenomena we can see from outside come about. They seem to be trying to convince someone that feedback can be observed in all aspects of behavior, as if that is a theory and not a matter of observation.

The Smiths' attempts at theorizing are puzzling, the most puzzling aspect being their complete failure to make use of control theory. Control systems have some very odd properties, *counterintuitive* properties, yet the Smiths never mention them—one can't help wondering if they even know about them. Control theory shows us how to make models that predict the details of normal behavior very accurately, how to measure parameters of behavior quantitatively, and how to devise new experiments with outcomes that can be tested, thus testing the models. The Smiths' approach seems to skip directly from a purely empirical experimental program to grand flights of

fancy, without pausing to address the ground between these extremes, the practical question of how such systems have to be organized to work as they do. I don't see any sign that the Smiths have used the methods of systems modeling (maybe they threw that baby out with the murky bath-water of digital computer metaphors).

What all this comes down to is that the Smiths seem to have failed to learn control theory itself. They know that control occurs, but have only a sketchy acquaintance with how control occurs. They use some of the language and buzz-words—of control-system engineering, but none of the quantitative methods and basic insights (their historical review doesn't even mention control-system engineering). I won't say this is a pity, because if they had included such knowledge from the start, there would have been no need for me to have done my work, and I would have lived a very dull life. I should be grateful to the Smiths for having left me a way to make a contribution.

The Smiths will find much support and understanding among the control-systems theorists with whom I associate, provided that both sides are willing to learn as well as teach. I hope that like independent bands of explorers encountering each other in the midst of the wilderness, the two groups can offer mutual support to each other and avoid falling into a dispute over the tiny bit of territory that they can see. The little clearing in which we stand is surrounded by a vast new continent; no one knows what surprises and mysteries it contains. We had better move carefully and stay together.

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Comments for the Smiths

By Tom Bourbon (Dept. of Psychology, Stephen F. Austin State University, Nacogdoches, TX 75962). Copyright 1989 by Tom Bourbon.

How might I comment, in a few words, on the Smiths' long review of decades of research? A colleague asked me if their work is empirical-descriptive. I replied that it is *entirely* empirical-descriptive, with not a hint of a reasoned causal model, but that everyone who professes an interest in cybernetics should explore their literature. In a torrent of often elegantly

conceived studies, they confirm the *fact* that, by their behavior, people control events in their environments. Small wonder that most "behavioral scientists" do not cite the Smiths: their work comprises a direct empirical refutation of the popular ideas that either the environment, or neuro-cognitive plans, control behavior. The Smiths say it well in few words: those ideas are wrong.

But having said that, what alternative explanations do they offer? Do they appeal to principles of control that allow precise quantitative predictions of the results of their experiments on control behavior? They do not. Instead, they offer a seemingly plausible verbal description—a recasting of their original description of the data. And their diagrams of relationships between muscles, brains, environments and sensors evoke descriptions such as piquant, surreal, and whimsical. Absent a model that generates accurate quantitative predictions, the Smiths' otherwise important research does not comprise a developed science of behavior.

I do not criticize the Smiths, or their research, or their insistence that we must study behavior quantitatively, as a continuous process. But I do claim that they offer us abundant evidence for the cybernetic *nature* of human behavior and performance, rather than for the cybernetic *basis* of behavior and performance. They claim to offer the latter. The principles identified by William T. Powers and his colleagues as "control systems theory" (CST) comprise the most effective contemporary model of control behavior. My remark is not a mere assertion: the accuracy of quantitative predictions by CST is a matter of published record. The model in CST, or an alternative that offers even more precise predictions, should such an alternative ever arise, is fundamental to a contemporary cybernetic science of behavior.

On page 8 of CC #15, the Smiths say that 'Powers' conceptual approach in some ways resembles ours ...," but unfortunately, Powers undermines the credibility of his arguments by completely ignoring the behavioral cybernetic contributions of K. U. Smith and colleagues in the 12 years prior to 1973," when Powers published two major works on CST. For the historical record, it is true that Powers did not cite the Smiths in 1973, but it is equally true that from the mid-1960s until 1989, the Smiths did not cite the principles of control identified in two articles by Powers, Clark, and McFarland, in 1960-13 years before Powers' individual publications. For nearly 30 years, the Smiths offered up a wealth of empirical evidence for the existence of control, with never a mention of a reasoned explanatory model. All the while, that model existed in the form of CST.

Also for the record, the first public presentation of CST by Powers, Clark, and McFarland was in 1957, as part of a discussion series sponsored by Carl Rogers at the University of Chicago. The opening paragraph of the paper that accompanied the presentation asserts the fundamental nature of the control model:

> ...the properties of feedback systems as we will outline them here apply to any feedback system, whatsoever. We are not *postulating* that these properties hold; rather, the fact is that if a system is a stable feedback system then these properties we shall outline are in fact properties of the system, by its very definition. Thus, if the components of any psychological theory can be matched functionally to the components of the general feedback system, the properties we shall outline must necessarily hold. They are mathematically necessary corollaries *[sic]*. (1957, page 1)

The model described that day in 1957 explains the wealth of data offered by the Smiths.

The Smiths express understandable chagrin that their work is not cited more widely. Control theorists share their fate and

their feelings! Contemporary cybernetics would benefit, were these two endeavors—one rich in data, the other in theory—to join. For my part, the title of a chapter by me (Bourbon, in press) acknowledges the many publications by the Smiths and associates on the phenomenon of "social tracking," in which the behavior of one person is part of the perception of another, and vice versa. This in spite of the fact that my work was motivated entirely by a desire to assess the applicability to social interactions of formal principles in CST, rather than by direct consideration of work by the Smiths. That is not meant as a criticism of their work, but as an indication of how research can be devised to test the CST model: if its predictions fail, it fails. (It passed the test of modeling social interactions.) Should I enjoy the good fortune to publish more on such topics, I will include citations of the Smiths every time their work is relevant.

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The Cybernetic Basis of Behavior

By Ernst von Glasersfeld (Scientific Reasoning Research Institute, Hasbrouck Laboratory, University of Massachusetts, Amherst, MA 01003). Copyright 1989 by Ernst von Glasersfeld.

The piece by the Smiths in CC #15 brought home to me once again the peculiar seclusion in which researchers do their work, seclusion generated partly by their own blinders, partly by the provincial attitude of the scientific establishments into which, whether we like it or not, we have to fit ourselves if we want to do anything at all.

From 1970 on, I worked for 17 years in a Department of Psychology, and because my background had been in early Italian cybernetics rather than in psychology, I had two mentors who were specialists in perception and cognition respectively. Neither of them ever mentioned the Smiths' work, and I have good reason to believe that they had never come across it.

In their article, the Smiths note with some bitterness that Bill Powers failed to cite their work. It would not surprise me at all if Powers, in spite of considerable search for precedents of the application of feedback notions in the analysis of behavior, had never stumbled on their reports.

In the same vein, it would be easy to complain that the Smiths' survey never mentions Piaget, who as early as 1957 made the first references to "feedback," Warren McCulloch, and Ross Ashby, and from then on became progressively aware of the

fact that much of the theory of cognitive development he had started to build some 20 years earlier could be considered "cybernetic." And Piaget, of course, never mentioned the Italian cybernetician Silvio Ceccato, who, during the same years, produced a theory of conceptual construction that was in some ways parallel to Piaget's "Genetic Epistemology" See (Beth, Mays, & Piaget, 1957) and (Ceccato, 1964, 1966).

This perpetual reinventing of approaches—if not wheels, then well rounded ways of thinking—has been par for the course—It may seem uneconomical in retrospect, but given the concentration of energy and attention it takes to develop any moderately consistent way of thinking for oneself, I am somewhat sceptical that even the most sophisticated and powerful computerized "knowledge banks" will significantly change the pattern of productive thinkers. Given this outlook, I try to see it differently: to discover that someone else has come to conclusions similar to one's own, be it earlier or later, should be an occasion to celebrate.

Thus, I was delighted to find that the Smiths, too, insist on the idea that all perceptions and all knowledge spring from the subject's own actions and operations, and that the rate of emergence and development of cognitive operations is "defined by their complexity and adaptive utility." Incidentally, thanks to a Russian colleague, I have recently learned that both these ideas were quite clearly expressed, long before Piaget's La *Construction du Reel chez L'enfant* (1937), by Aleksandr Bogdanov (1909).

However, given that the ideas of the Smiths and their coworkers were expressed in *English* in *this* country and have therefore been readily available for some 30 years, it is not very encouraging for cyberneticians that they seem not to have had much noticeable influence on the orientation of the psychological establishment and other students of behavior.

I am certainly not competent to assess the value of the extensive "empirical" work the Smiths cite. Their theoretical exposition, however, leaves me with a couple of questions. (1) "Living organisms," they write, "organize and control their own development..." by means of feedback (page 18). I would not quarrel with this. But feedback loops cannot control anything without reference values—and I would be curious as to what the hypothesized higher-level reference values are, and how they are set "from fertilization to death." (2) The "reciprocal social tracking" that establishes an "integrated" social system is, as I understand the text, not unlike what readers of CC have come to know as the generation of what Humberto Maturana calls *consensual domains*. It appears that linguistic communication and "symbolic transforms" play a part in this integration and that "the speaker hears words, phrases, and sentences with meaning..." (page 16), but to me it is not clear how the authors envisage the abstraction of meaning, especially of the kind that cannot be manifested on the sensory-motor level of action.

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Forging Feedback for the Smiths

By Paul Ryan (924 West End Avenue, Apt. 42, New York, NY 10025). Copyright 1989 by Paul Ryan.

Who are the Smiths? What have they forged from the notion of feedback? The phenomenon of the cybernetic Smiths amazes me. I knew nothing of their work until *CC* #15. Are the Smiths a twentieth-century kinship system that has taken "cybernetics" as their scientific totem? What would a cybernetic Christmas at the Smiths' be like? Everybody tracking everybody else? Or are the Smiths some kind of cybernetic mafia? Must I watch what I write, lest they feedback something I don't like but can't refuse?

If I showed the *CC* text to my feminist daughter, she'd start a rant about academic-hierarchic patriarchy. The text is problematic. Receiving it along with the ASC President's Report makes me think that the field of cybernetics needs a good genealogy in the manner of Foucault. How did work on the scale of the Smiths get isolated from "mainstream" cybernetics? What are the underlying conflicts that led to this isolation? Has the vocabulary of cybernetics been used in this case to forge a "doctrine" for an empirical sect, something that borders on the rigidity of traditional religion?

No Smith participated in the Macy conferences, which I take to have been the critical meetings in the generation of cybernetic discourse. I've always thought it was a grave omission that the Macy meetings didn't include the poet Charles Olson. Can the same be said about K.U. Smith?

It is the doctrinaire closure of the text that bothers me. We need discourse, not doctrine. Why the Smiths ignore the work of others in the field is beyond me. How can they assert hierarchy as universal and ignore McCulloch's paper on heterarchy? How can they go on about evolution and ignore Bateson's work on stochastic processes in *Mind and Nature?* How can they talk about cybernetic evolution on this planet and ignore the cybernetically coded Gaia Hypothesis of James Lovelock? How can they talk about behavior without looking at Al Scheflen's *How Behavior Means?* (Scheflen and others were using film and television to record and analyze behavior in the 1950s. In the late 1960s, Schefflen and I, along with others including Marco Vassi, Frank Gillette, and Harry Shands, participated in a series of behavioral experiments with television feedback at Vic Gioscia's Center for the Study of Social Change in New York City.) The Smiths' doctrinaire sense of closure is also evident in the fact that they report on no outstanding anomalies in their own work.

All that being said, let me attempt to engage the text and discuss "the neurogeometric hypothesis." Intuitively, I agree with the hypothesis—20 years of working with portable video systems as cybernetic tools have convinced me of the critical relation between behavior and perception. One of the things I have done as an artist is to learn T'ai Chi Chuan and adapt the movements to video camerawork. My use of video to extend my perceptual system is strongly coupled with the movement of my body in space.

However, the anomaly in my experience with video has been the experience of space without orientation. This begins with the simple fact of seeing one's image live on a video screen when it is taken by a camera on top of the screen pointing in the same direction as the screen. If you attempt to shake hands with yourself in such a configuration, the simulation of a handshake will work. If you attempt to shake hands with yourself in a mirror, the simulation will not work, because the mirror image reverses left-right orientation. The video image returns your hand to you without reversing orientation. You can shake hands with yourself. The video feedback experience maps onto a non-orientable Möbius strip.

I know of two similar anomalies. One is that gypsies are re-ported to navigate their travels without a sense of left and right orientation. The other is that, according to research done by Russian scientists in the 1960s, the reticular core of the nervous system operates without orientation. Unfortunately, I cannot cite references for either statement, having learned of them "on the road," but I believe references can be found.

What I did with this anomaly over the years was to develop a non-orientable relational circuit (described in *CC* #12). This circuit is heterarchic, not hierarchic. Interestingly enough in light of the Smiths' behavioral cybernetics, I have used this circuit to invent a repertoire of behavior for three people that is possible only if you move in the non-orientable space of the relational circuit.

I invite discussion regarding behavior between the Smiths as cybernetic scientists and myself as a cybernetic artist. Agreed the stimulus-response business isn't right. What can the Smiths say about non-orientation and behavior? Is non-orientation an anomaly in the cybernetics forged by the Smiths?

The Cybernetics of Pleroma:
A Response to the Smiths

By Philip Lewin (Liberal Studies Center, Clarkson University, Potsdam, NY 13676). Copyright 1989 by Philip Lewin.

Many readers of this newsletter share a deep affection for the thinking of Gregory Bateson. Speaking for myself, the quality of Bateson's thought which I probably find most appealing is his steadfast refusal to oversimplify, to respect as fully as possible the complexity of the phenomena he hoped to elucidate, to "leave the darkness unobscured." Bateson approached his partners in inquiry—alcoholics, dolphins, Micronesian cultures, families, organisms, schizophrenics, ecosystems—like a child might: evocatively, playfully. He allowed himself to be engaged as he elicited response. There is a respons(e)ibility in his work, a conversation among equals in which the object of the discursive practice is not domination, but simply the maintenance of the interaction long enough for its pattern to emerge and clarify. Not a game at all, really—no winners; much more a dance, a languaging, an intimate exploration. His is an old science, a science of resemblance, of pattern, of metaphor, of the creatura, a science alive to mystery and wonder and its own potential for folly.

The behavioral cybernetics of the Smiths could not be more different. This may sound curious, especially insofar as their general claims sound so compatible with both Bateson's close concern for the cybernetics of systems and his larger integrative vision. "Our general thesis," the Smiths say, "is that human behavior, in all of its modes and manifestations, is cybernetically organized like all other known biological processes, and that scientific understanding of all phenomena involving the human organism, from learning to work to evolution itself, must begin with fundamental recognition of the inherently cybernetic nature of human behavior and performance and the human condition." *(CC* #15, page 1) Similarly, when we see how they have extended their ideas into evolutionary theory, our first impression is one of agreement: "All living systems actively control their environment." (page 24) Yes, indeed. Who could object?

Perhaps that's the problem; as generalities, there is nothing objectionable about the Smiths' larger claims. But when we move from the generality to the content that would support it, I sense an enormous gap—a gap which suggests a kind of myopia in their perspective to the kinds of complexities and specificities which truly would constitute a "cybernetic basis of human behavior and performance."

Let me start with an example, taken from their critique of Darwinian theory. They remark: "The assumption that a living system, which in all other respects self-controls its own existence, its own organization, and its own functions, nevertheless can be selected in evolution by some abstract environmental force strikes us as an absolutely ludicrous and preposterous scientific concept." (page 25) But this is wrong: natural selection is not abstract. It is Darwin's term for a collection of very concrete phenomena, of floods and famines and natural disasters, of illness and accident, of changing climatic regimes, of variations in the populations of predators and prey, whose effect is the ontogenetic elimination and phylogenetic extinction of far more organisms and species than survive. Under these circumstances, to suggest that "whether or not a system survives, develops, and reproduces is a function of its competency in controlling its environment" (page 24), without any further specification, is inadequate.

I find this inadequacy over and over again in the Smiths' essay. For instance, despite their critique of behaviorism and their emphasis on cybernetic agency, I get no useful sense of human cognitive or non-behavioristic psychological capacities from their work. We are told that self-regulated guidance of behavior depends on continuous motor control of sensory feedback, as though this were a perspective of which behaviorists and information-processing scientists were unaware. Yet not only is there no incompatibility between the work of the Smiths and behavioral and cognitive science psychologies, the latter psychologies actively acknowledge and depend upon feedback control. Cognitive science traces its ancestry to the TOTE model of Miller, Galanter, and Pribram, and its subsequent dependence on work in artificial intelligence is too obvious to require emphasis. In the case of behaviorism, the cogency of operant conditioning explicitly assumes motor control of sensory feedback. If this were not the case, there would be no reason why a particular reinforcement would function for the organism as pleasant or unpleasant, as reward or punishment.

In contrast to the presumed but unstipulated shortcomings of behaviorism and cognitive science as theories of mind, the Smiths argue that "thinking involves variable modes of feedback transformations in control of sensory feedback.... [It] is an active, motor-based, sensory feedback control process, not a detached mental process. The distinctive forms of cognitive behavior are assumed to be based on varied types of transformations of sensorimotor feedback relationships." (page 11) Again, at first glance this sounds promising. But if this is indeed their perspective, then one wonders how their work stands with respect to the dominant contemporary cognitive paradigms within psychology, and most particularly, how it stands with respect to the work of Piaget.

Piaget, after all, was among the first to systematically examine the relation between sensorimotor activity during the first year of life and cognitive development. He concluded that via a process that he called "reflective abstraction," activity in the world could be reconstructed on the plane of thought, and that this process of reconstruction, with corresponding modifications of existing structures (cognitive, affective, behavioral), characterizes cognitive activity through life.

But the Smiths do not mention Piaget or genetic epistemology or the cognitive-developmental tradition. Once we see precisely what they mean by "sensorimotor feedback relationships," perhaps this omission becomes comprehensible. They report, to give only one example from their review of "Motor Feedback Control of Language, Speech, & Music," that "the cognitive and talent factors in musicianship are governed primarily by facial laterality coordination," and that "the musical domain and the language domain... are governed primarily by specific characteristics of facial laterality in the control and integration of the cognitive operations of musical performance and fluent

speech, respectively." (page 17) Facial laterality *governs* speech and musical ability? This is an interesting claim; it may be correct, though I am puzzled both by the linearity and the direction of the causality which they propose. These are curious enough in thinkers who claim to be cybernetic in their orientation. But worse, facial laterality as a variable has nothing whatever to do with thinking, or with behavioral self-regulation except in the literal sense of muscular control. If muscular control is what the Smiths are about, where is the originality of their work? Self-regulation through motor and biochemical feedback has been well understood for decades. Yet at the same time as the Smiths seem to have conflated the activity of mind with its necessary but not sufficient neurological substrate, they have also omitted considering any rich conception of developmental self-regulation which could link the neurological to the mental and behavioral, such as Waddington's homeorhesis or Piagetian equilibration or Bateson's deutero-learning or Maturana's autopoiesis, etc. That they omit thoughtful consideration of work done by others which is centrally relevant both to their empirical claims and to their claims for intellectual primacy considerably restricts the range within which their work can be taken seriously.

A far more important kind of impoverishment characterizes their senses of social processes and of human history. We can look at these in turn.

The Smiths claim: "Although others also have commented on the significance of culture and technology as human evolutionary catalysts, our focus on biosocial behavior as the underlying feedback control mechanism is original." They go on to say: "The artifacts and records which constitute the anthopological and archeological evidence of past human systems suggest that each stage of human evolutionary change consisted of interrelated reorganization and revised human-factors design of communication (language and cultural forms), tool/machine technology, architecture, and organizational management of existing levels of work and society." (page 22) As a claim for originality, this is simply silly, as though traditions of thought from Marxism to cultural anthropology, and everything in between, were unaware of biosocial processes. And what a comically curious conception of how society functions! This is the Enlightenment vision announced as though it were news, a vision of human society as the consequence of rational organization and management. And so we are given, after the fashion of Condorcet or Rousseau, a just-so typology of biocultural evolution (in their Figure 8) and of cognitive development (Figure 4) and of human thought (Figure 5) and of technology (Figure 9) in which (lo and behold) contemporary computerized society emerges as the latest and best, the outcome of three million years of (dare I say it?) progress. The white scientist—presumably male, presumably with a doctorate, presumably of the leisure class—is revealed to be the crown of creation.

This kind of historical reconstruction disturbs me. It disturbs me because it ranks cultural achievements on a universal scale (cf. Figures 4 and 5), as though the sole valid epistemological distinctions are those which reproduce the disciplinary divisions of the contemporary university. It disturbs me because the implicit criterion in terms of which that ranking is made uncritically reproduces the value system of western scientific thought, as though the quality of thought that generates music and art and mathematics and religion and writing and science and dance and myth could be ranked. It disturbs me in its mindless championing of the value of management and control of human society (cf. Figures 5, 8, and 9), as though the story of the 20th century could be written by conveniently omitting any mention of the atrocities of fascism and genocide which management and control continue to wreak. It disturbs me in its biocultural and technological evolutionary schemata, which so conveniently delete any mention of colonialism or imperialism or exploitation or slavery or the search for new markets or oppression, or any other material historical fac-

tors. We are told, 'During the course of civilization, science, education, and commercial/industrial technology have formed a feedback triad for generating new technology...' (page 23) What a self-serving idealization! You'd never know, from the Smiths' fable, of the connection between technology and the pursuits of war.

It disturbs me because its presuppositions about social process are, at best, too global to mean much of anything. For the Smiths, "the primary selective mechanism of behavior consists of mutual, interactive, feedback-controlled relationships between individuals in communication and social psychomotor activity, which we have designated by the term social tracking." (page 23) Is this an oblique reference to contemporary investigations into social referencing, into interpersonal punctuation, into the dynamics of families and groups, into the transactional interactions between mothers and children? What's the relation between social tracking and status, power, respect, coercion, loyalty, prejudice, kindness, defiance, compassion, fame, deception, jealousy, courage, manipulation, cruelty, self-deception, envy (just for starters)? If social tracking is intended to characterize the essential nature of these phenomena, it is a bromide; if it is intended to offer substantive and specific insight into them, it is a sham.

The Smiths argue: "The most significant contribution of behavioral cybernetics may turn out to be that it represents the theoretical and objective experimental accommodation of behavior science and psychology to the global societal revolution in computerized and television communication." (page 4) Perhaps this is where I am most disturbed: their conception that human-computer systems are the apotheosis of human endeavor. Where, outside the white middle-class bourgeoisie, has the computer made an impact? What arguments can the Smiths offer against those who claim that the investment in "universal feedback controlled machines" is simply the latest technological fix, that it is not the solution but the problem, that in its reinforcement of instrumental values it generates the very social pathology it claims to cure? How would they respond to those who agree that the effect of the introduction of computers is "monitoring and control of persons" (page 24), but find this odious because its real-world consequence is the increasing homogenizing of cultural difference, on the one hand, and the increasing differentiation of society into rich and poor, mainstream and underclass, on the other?

And where, by the way, is this global social revolution? How could I have missed it? Why, if we can be shown so many Figures offering cheery visions of progress—logarithmic progress, no less—do the threats of war, of famine, of environmental collapse, of global economic disorders, of social chaos seem so palpable? The only worldwide revolutions I see are toward increasing environmental degradation and social fragmentation, particularly as indigenous groups do their utmost to resist precisely the intended hegemony of "biosocial tracking."

Perhaps I can summarize my sense my sense of the inadequacy of the work of the Smiths, despite its superficially encouraging rhetoric, by returning to Bateson. The difference that makes a difference between the cybernetics of the Smiths and that of Bateson is that the former is pleromatic. The Smiths' is a science of objective investigation, in which investigators stand apart from and manipulate their objects of study, without engagement, with detachment. Their cybernetics is first-order, a cybernetics of the observer. They seem unaware of even the possibility of second-order cybernetics, a cybernetics of the observing system. As investigators of specific motor feedback effects, their findings may have value; but as theorists of the larger whole within which motor feedback is a part, their ego inflation renders them unreliable.

Their work could be a case history of a crucial fallacy within the tradition of Cartesian objectivity, namely that which occurs when the *methodological* technique of detached observation is

assumed to transparently confer *epistemological* superiority. For it could only be some such notion of inherent superiority, of genius unrecognized, that would warrant the claims to priority of insight which the Smiths make. And it could only be some such unexamined epistemology of the ultimate autonomy of the isolated *cogito* that would account for their impoverished conceptions of society, of history, and of material forces, and their seeming unawareness of the work of those others—among whom I would include Marx, Gramsci, Piaget, Vygotsky, Maturana, Bourdieu, Foucault, and of course Bateson—whose insights could considerably enrich their own. The last thing we need at this point is more pleroma.

"Texts in Cybernetic Theory": Five Viewpoints

For almost a full week last fall, about 60 people met at a camp in Felton, California, for a "working conference" sponsored by the American Society for Cybernetics and organized by Dr. Rodney Donaldson. This 'Texts in Cybernetic Theory" Conference was devoted to intensive elucidations, analyses, and critiques of ideas put forth by Humberto R. Maturana, William T. Powers, and Ernst von Glasersfeld—with all three of these "cybernetic theorists" in attendance. At the close of the conference, many of the participants agreed that the meeting had been quite successful at providing insights into the three theorists' claims and suggestions.

Using audio tapes made at the conference, Dr. Donaldson is now preparing a record of the conference for publication; contact him for more information (Whole Systems Design, Antioch University Seattle, 2607 Second Ave., Seattle, WA 98121).

Below are replies from five conference participants, including one of the featured theorists, in response to an invitation (sent to all participants) to share their thoughts about the event with *CC* readers.

Footnote to Felton

By Mary A. Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1989 by Mary A. Powers.

The ASC meeting on texts in cybernetic theory differed from most ASC meetings in that it was focused on the theoretical and scientific side of cybernetics, although the participants included some of the people who give ASC its unique flavor among scientific societies: those who draw artistic inspiration from cybernetics, and those who anchor their political agendas to it. Not that scientists lack poetry or political agendas—simply that the focus was on science, and I think productively so. For what emerged (in my mind anyway) over the five days of the meeting was a picture of the way in which a cybernetic approach to the life sciences differs from the route followed by conventional life scientists, whose views are informed by a desire to make the life sciences as much like the "real" (i.e., physical) sciences as possible.

There are principles and there are principles. The most fundamental principles of science, to me, are essentially moral in nature. Thou shalt not fudge thy data. Thou shalt... lots of things, having to do with honesty and sharing and other kindergarten virtues. But over the years, other principles have developed which seem fundamental to most practicing life scientists but which, interestingly enough, are called into question more and more by the very physical scientists who are supposedly being emulated. The prime example is the existence of an objective reality. Another concerns cause and effect as a neat sequence of events over time. These ideas

have been out of date for 50 years in the mundane world of control engineering, not to mention some of the more rarified branches of physics. The news has not yet reached the world inhabited by, for example, editors of psychology journals, since, as Thomas Kuhn explained, a scientist-in-training learns about other sciences only at an undergraduate level, as a set of givens, and proceeds onward through a professional career (say, in psychology) knowing only of, say, physics, what was picked up as a sophomore 20 years before. And in such science courses, problems in the philosophy of quantum physics or the nuances of control theory (currently a senior year course for engineering majors) are not exactly hot topics.

Cybernetics, on the other hand, shares the doubts of modern physicists about the realness of reality, and is also rooted in control theory and all that that implies in terms of the simultaneity of "causes" and "effects," and the effects of effects on causes, and the dependence of both on that teleological bogeyman, purpose.

So in Felton we had three scientist/philosophers, deeply concerned with the life sciences, and far ahead of their fellow life scientists in their familiarity with, and recognition of the necessity for, an approach to living systems that takes into account the fundamentally subjective, constructivist view that living systems, including scientists, have of whatever "real reality" may or may not be. An approach that also accepts and justifies the legitimacy of concepts like goals, purposes, and intentions.

The result was, to summarize almost to parody, the glimmering in at least a few people that science may be, after all, capable of producing a theory of living systems that a living system capable of thinking about such things can accept as being about himself or herself without demeaning, depersonalizing, or diminishing that self. Truly, such an acceptance must be a critical test of a theory of living systems: not how a "subject" (read "object") looks to an "objective" observer, but that the same ideas apply acceptably both to others and to oneself. From three very different backgrounds, the three scientists at Felton were converging, I think, on such a theory.

The Highlight for Me

By Michael Morgan (P.O. Box 70277, Sunnyvale, CA 94086). Copyright 1989 by Michael Morgan.

I was at the conference. As usual, it was stimulating, frustrating, and formative. Also as usual, I experienced more than I can describe in words.

However, I do remember one interaction in one day's session that I can refer to, and which was particularly suggestive. I cannot reproduce (or evoke in the reader) the whole context for it, but here is the condensed version.

At one point Herbert Brun interrupted Humberto Maturana's remarks and suggested a revision to what Maturana had said. The two agreed upon the sentence: "The artist creates experiences."

That was the highlight for me.

Making It Clearer

By W.D. Williams (1850 Norwood, Boulder, CO 80302). Copyright 1989 by W.D. Williams.

I found the conference made three things clearer for me. In commenting on what the conference clarified for me I may appear naive. I'm sure I *knew* what I learned at the conference before I arrived there. What the conference did was to point out vividly the consequences of what before was dimly understood.

The first is that theoretical constructs which are psychologically and culturally satisfying and functional need not have a grounding in an evidential reality, nor even be internally consistent. Most persons appear to require some minimum way of making some sense of the world, a "world view." But the flexibility inherent in human capacities and the differences in human experience and culture permit people to construct their worlds in diverse ways. Issues of internal consistency and factuality are to some extent beside the point. The functionality of world views is founded on other sources.

The second thing which I realized at the conference is that people are rarely inclined either to subject their own world views, or allow others to subject their world views, to criticism. Of course, there's good reason for this. If your functioning depends to some extent on maintenance of a given world view, you are going to choose carefully the circumstances in which you consider dismantling and altering that view—The alternative seems to be accepting a possibly inconvenient disorganization of your perceptions and actions.

The third thing which I saw at the conference was a tactic of presenting world views *as if* they were scientific constructs. This misrepresentation, it seems to me, introduces a confusion. A characteristic of scientific constructs is that they should at any time be open to critical examination. What passes for science, as it is practiced, often violates this precept. But failures in practice don't refute the principle involved. And science has often provided, more or less, the foundations upon which world views have been constructed. But the distinction between the two remains.

It appears to me that the question facing contemporary cybernetics is whether it should be a forum for competing world views, or a scientific enterprise. Perhaps it could be both—but this would seem to me to be an unstable situation. The criticism which should be a part of science is socially unacceptable when applied to world views. And world views, at least in the last three centuries, have often presented themselves as being scientific in character—which is fraudulent. In obvious cases, such as Mary Baker Eddy's "Christian Science," we have developed a set of social conventions by which we ignore the absurdities of the literal claims. But—and this is an important *but—Christian* Science practitioners also observe these conventions by not applying for faculty positions in university chemistry departments. In cybernetics, however, the distinction is not so clear cut. I would prefer that it be made clearer.

As Wiener described cybernetics, in terms of the theory of control and communication, the field had obvious social implications, and perhaps it seemed that there would at some future date even be a cybernetic social theory. The methods employed by Wiener, however, were those of the domains of science and engineering. I don't by any means minimize or denigrate efforts to construct or choose a world view. This is an important question. At present, though, it is a question which remains a matter of personal predilection and social functionality rather than of science and engineering. Mixing the two sorts of things, science and a search for world views, is a result of a confusion regarding the nature of the two domains. Contemporary cybernetics, I am convinced, is largely a product of that confusion.

The Yellow Brick Road

By Mary San Martino (1146 Beacon St., Brookline, MA 02146). Copyright 1989 by Mary San Martino.

Thank you, Greg, for inviting our reflections on the Felton Conference. I have been busy integrating what I heard and read there with what I had already read and thought, and organizing these ideas into a meaningful and useful frame for thinking and for living, personally as well as professionally as a therapist. This is what we all have to do finally. I found the experience at Felton very energizing and self-validating. I particularly liked the time allowed between the three presentations for reading, reflection, and discussion.

Like most of us, I have been involved in the quest for "Truth" and, consequently, in the effort to find an epistemological frame for my life. In the conference readings, I found Ernst von Glasersfeld's approach scholarly and empathic in its discussion of the history of epistemological doubt. Maturana, on the other hand, ignored all previous philosophical discussion and included only one other biologist, Lynn Margulis, with his own references. In so doing, he demonstrated his premise, much like a metaphor, that all descriptions are distinctions made by the observer. He seemingly freed himself (and maybe others) from any further anguish in the pursuit of a comprehensive reality. At first I jumped at the possibility that I need not "worry" about what I could not "know" about objective reality (not in parentheses)—For myself, this relief had come first in the form of a self-validation that I could be the fulcrum of my experience, as I lived it and gave it meaning, when I became involved in the training of the Milan School of Systemic Family Therapy in Italy. There I learned to reframe behavior in terms of circular patterns of meaning learned over time in family and group experience, and to shed the well entrenched linear view of more traditional judgmental thinking. Gregory Bateson, Milton Erickson, and, later, Heinz von Foerster guided me into new vistas of thinking and clinical practice. In Felton, I was struck with the differences between von Glasersfeld and Maturana both in terms of what they said and also in their styles of presenting and discussing.

Ernst cries out for coherence and self-reference in his explanation of the experience of living, but in his constructivist view does not limit the mind in its search for a more comprehensive transcendent reality. Indeed, he gives respect and historical validity to the continuing search of the agnostic for meaning beyond self. Maturana appears to me as a passionate believer in "objective reality" acting as though he has substituted one belief system for another with the use of parentheses. His argument is logically sound; his autopoietic theory is coherent and circularly closed to new information outside itself. In a paper (Maturana, 1988), he chants repetitively at the end of each section: 'This is what we can be aware of now." I am delighted that he includes what might pass for mystical poetics in his passion for explanation. Is he leaving an opening for future new information?

It is just this passion for explanation that continuously drives agnostics to ask and search for a more comprehensive view. Like many, I have from early days been involved with the existential dilemma of finding relevance and meaning. More recently, Georges Bataille (1988) has emphasized the turmoil of the contradictory needs of feeling sufficient or insufficient in our "being" and our ontological search. Bataille and Jean-Paul Sartre (n.d.) state very clearly that Ontology itself cannot formulate ethical precepts. But Ontology does bring forth the origin and nature of the search for value and meaning beyond self and immediate self-awareness. Ontology as search is just as necessary as is autopoiesis to attempted explanation. I agree with von Glasersfeld (personal communication, 1988) when he says that coherence is necessary but not sufficient for a comprehensive philosophical system.

In Felton, I found it ironic that Ernst, with his scrupulous, conscientious approach, did not respond to the need for an ethics that could evolve from his constructivist position. I think this detracted from his presentation and did not do justice to his work. To say the least, it frustrated those in the audience who were looking for a path to an ethical formulation for behavior as an outcome of his thinking. Maturana, on the other hand, after invalidating the agnostic search for an objective

reality, developed his ethics in terms of passion and love in the praxis of living as a logical conclusion.

Norbert Wiener has added to my current attempt to integrate these ideas with an ethics that must impact on current environmental as well as philosophical dilemmas for survival in a complex life. His 1950 book offers a great deal of food for thought as to how to incorporate the cybernetics of living into a coherent and effective code of ethics. In my attempt to translate the terminology of cybernetics and engineering into a more general language, I have been thinking in terms of the "rules of governance" that might establish an ethics for any physical or social system. I like the term "governance" since it has implications in the mechanical world as well as in that of government and society. Such an ethics, following Wiener's thinking, must emphasize the fight against entropy and the survival of human life on earth.

In closing, I must recall the yellow brick road in the *Wizard of Oz*. Many of us have been in search of the Emerald City and the Wizard himself, only to find the insight, humanity, and courage in the eye of the observer after all.

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By Any Other Name

By William T. Powers (1138 Whitfield Rd., Northbrook, IL 60062). Copyright 1989 by William T. Powers.

My friends and others have been trying to convince me that I should stop using the word "control" and substitute something else like "regulate" or, more lately, "conserve." I dutifully try on such terms, but they seem to lead to the same sorts of problems that the term "control" creates: unwanted associations. While I am not going to fight any last-ditch salt-the-fields battles over a word, I would like at least to explain why I want to continue using the same term. If my reasons are totally unimpressive, then I suppose I shall have to give in as gracefully as I can. I can always write about "control" under an assumed name, which you can take any way you like.

Here is what the word "control" means to me: acting on one's own world of experience to make it become and be what one wants to experience. That is what is left when the idea of control is stripped of its mathematical trappings and engineering terminology without being untrue to the underlying meanings.

Through studying the process of control, I concluded long ago that controlling is the essence of what we call "doing." To do is to control without consciousness of effort. When we fail to control, we call it "trying." When the process is working but we are having some sort of difficulty, we say we are "seeking a goal." When we know how we would like things to be but have no idea what to do to make them be like that, we say we are "wishing" or "desiring." When we try to control more than one experience at a time and find that the aims are mutually exclusive, we say we are "in conflict." And when someone

else tries to act on us so as to violate our own autonomous organization as control systems, we fight back and say we are "being coerced." We do not give in easily to coercion.

That last is the reason I am being asked to use some word that seems nicer than "control." Nearly every objection I have heard comes down to an objection to people controlling other people. For example, Ranulph Glanville (1987) claims that the idea of control is the same as the idea of command, and that control is a fascistic notion. And Heinz von Foerster maintains that the idea of a hierarchy of control means only a social system with a dictator at the top level. To many others, controlling is the same as forcing oneself or others to do things they don't want to do, by overcoming one's own lesser desires or by applying or threatening to apply overwhelming physical force to others.

It doesn't take a genius to realize that the nice people in this world have had some very bad experiences with control, as victims, as spectators, and even occasionally as perpetrators. My own reasons for wanting to understand this phenomenon go back to my personal experiences with others who wished to control me, to instances when I tried to control others, and to my horror at seeing what happened in my lifetime as a result of one person trying to control millions of others. But I also think it doesn't take a genius to realize that this is a real phenomenon; people do these things to each other, and changing a word is not going to alter that fact in the slightest.

The irony of it all is that people object to my use of the word "control" precisely because they recognize that the phenomenon of control is all too real. They experience it every day; they see it happening on television every day; they do it themselves every day, to friend and enemy alike, despite their best intentions. What they—what you, my readers on both sides of the issue—must realize is that renaming this phenomenon is not the answer to the problem. The answer can only be to understand what is going on.

The answer is not to stop controlling. Control theory tells us that if we did that, we would all collapse in a boneless heap and die immediately. To live is to control—that is the understanding I have reached in 35 years of studying this phenomenon. The problems among people do not arise from the fact that they act, every moment whether awake or asleep, as hierarchies of control systems, but from the fact that they do not know this is true of all living systems and do not understand what this implies.

If we are patient enough to learn the lesson, control theory can teach us why the persistent attempt to control another person always leads in the end to the pitting of violence against violence. There is simply no other way that one person can control another person against that other person's will. We can disguise this fact by a system of laws that partially conceals the threat of violence, but the threat and the actuality are there. We can pretend that our own violence is drawn out of us through provocations by others or by some kind of imperative or necessity, but whatever we pretend, we cannot cease to be in control of our own lives, and we cannot gain real and reliable control over another without the use of overwhelming physical force.

You mustn't think that I am merely moralizing here. I think that history shows how ineffective moralizing is. I'm not saying that controlling other people is a bad thing and we ought to stop doing it in order to be nice. I'm after something much more significant: I'm trying to convey an understanding of how controlling works, so we can see when controlling is a natural and necessary part of living, and when it is simply a mistake—when it defeats the very purposes it is supposed to achieve.

When we begin to understand what controlling is, how it works at every level of organization in a living system, we can begin to see how a person can have what seem only the

highest motives, yet in carrying them out end up murdering millions of people. Such results are never intended in the beginning. Adolph Hitler didn't start by saying, "I am going to kill all the Jews" (although he evidently concluded that this was what was required). He said, "I am going to restore self-respect to the German people and myself." Nobody with a scrap of remaining sanity sets out to act against his or her own sense of what is good. But acting in ignorance of human nature has exactly that effect. Pursuing a goal without understanding that others do precisely the same leads in the end to taking whatever action is required and available to reach the goal, including the use of repressive laws, stormtroopers, or bombs. *Whatever* it takes.

I believe that as we come to understand how living systems act as control systems, we will begin to make sense of what would seem otherwise a growing insanity that afflicts the human race. We will come to understand how a disparity of goals, coupled with ignorance of human nature, can lead to conflicts that begin small—that seem to grow out of nothing—and escalate in a drearily predictable way to the usual outcome. We will see that "offense" and "defense" are words for the same thing.

And I believe that out of this understanding we will be able to build another way to manage our relationships with each other.

I see the choice this way: we could change the word, or the world. Do you still want to change the word?

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Guestages

By Robert Flannery (421 Enterprise Dr., Rohnert Park, CA 94928). Copyright 1989 by Robert Flannery.

"How many handshakes or smiles nullify one high-power neodymium laser beam?" (Jerome Pressman, in Foell and Wenneman, 1986, p. 218)

Introduction

J. Kenneth Smail has written a proposal with the working title "Reciprocal Hostage Exchange..." (Smail, 1984) In this paper, I will use the term "guestage" (after hearing Michael Nagler use it) instead of "hostage," to better engage peace workers frightened by the violent associations of the latter word. "Guestage" has also been used by Kenneth Boulding (1982).

Description of Guestage Programs

"I envision this as a massive, deliberate-structured yet at the same time benign, programme involving at any one time the 'voluntary' transplantation of at *least* one million Americans and one million Russians across their respective boundaries... this is perhaps the most important point, that there be a significant number of sons, daughters, brothers, sisters, nephews, nieces (e.g. as many close relatives and friends as possible) of highly placed political, military, economic, ideological, religious, academic and intellectual leaders from each nation." (Smail, 1982, page 511)

Metaphors Guiding Theory

Smail's mutual hostage exchange program idea came from a practice of the ancient Roman Empire. The Romans took groups of captives from newly conquered areas to Rome, and they taught the Roman culture to the next generation of those conquered. (Smail, 1982)

"... avoid blaming one side or the other. Fault finding rarely solves the dynamic problems that exist in any relationship. A good marriage counselor would look for ways to break out of the current destructive patterns. There are many positive initiatives emerging from the private sector that grow out of this spirit." (Institute for Soviet-American Relations, 1984)

"A psychotectonic shift is to the realm of moral understanding and human behavior what a paradigm shift is to scientific understanding and behavior. It is a reconceptualization of what it is to be human—a transformation of our "self-model"—and it projects a shift in human destiny with a full range of legal, political, economic, social and spiritual consequences." (Fuller, 1988)

"Wars begin in the minds of men." (UNESCO Charter)

Benefits

Smail argues that the central short-term benefit of a mutual guestage program is a "very much reduced" likelihood of attack. The program's deterrent effect *increases* in times of increased tension. Over the long term, the program evolves from an "exchange system" to an "integrative system." Greater mutual understanding will develop. Cross-cultural marriages and families will create greater bonding between the cultures. Participants would learn *not* to operate out of "mutual distrust, fear, or lack of understanding." "As the programme develops, and becomes increasingly effective in the sense that both societies become less suspicious of, and more accustomed to, each other, [espionage] would be less 'necessary.'"

Costs

One million guestages will cost approximately $20,000 per year each. The total sum amounts to about 7% of the annual U.S. defense budget. This estimate may be high, since guestages may work in their host country and partially pay their own way.

Questions (from the San Francisco Friends House)

Would being part of an exchange single one out for surveillance?

Would the radioactive contamination from Chernobyl inhibit an exchange program?

implementation

A population of Americans in the Soviet Union and vice versa is presently being maintained. Should this process be encouraged? Should it be ignored? My application of the holonic model is to encourage this process as a method of balancing AmerRuss. A shortcoming of the present process is the lack of engagement of the relatives of the ruling elites. In order to be implantable in a human activity system, a solution has to be "obvious," i.e., tolerable to all involved. (Checkland, 1981) This proposal takes as given the stated policy of the U.S. defense system: "deterrence." The ruling elite of the U.S. has an interest in maintaining that lie.

Hypothesis to be tested by experiment: Debate on this proposal will fundamentally restructure U.S. defense policy. The primary difficulty in testing is opening the political communication system in the U.S. (and in the U.S.S.R.?). It will be difficult for

the mechanisms of repression in the U.S—to operate openly against private individuals who are implementing the stated policy of the U.S. (Participants in the decision-making process at a national level in the U.S. are often assassinated.) I do not know whether deterrence is a genuine policy in the U.S.S.R.

The effect of withdrawal from the arms race will be severe, possibly an economic depression. However, the process of recovery becomes more difficult the longer the system is in addiction. Therefore, recovery should be accelerated immediately, if not before.

Smail proposes a Universal Service to America as a method of recruiting volunteers. He proposes that "two years of 'national service' (broadly defined) be required of all citizens at some point between the ages of 15 and 35." This is his answer to questions about equity and fairness. (Smail, 1982, p. 518) I have a personal phobia of legitimized threat systems; perhaps the mandatory nature of a Universal Service is unnecessary—but at this time, what better alternative has been proposed?

Conclusion

"Conclusion" implies a view of existence in which theorems are derived from axioms. Living systems are more open than that. Ideas only have existence *within* the process of living systems. At best, a paper can catalyze a communication process which is a dynamic balancing within the process of the living system.

Invitation

To the defense establishment, to those for whom peace is a profession, please ask, 'To what goal is the arms race headed? Can you reliably foresee the next advance in weaponry? Who controls? Is it you, or the Russians, or the race itself?"

Gregory Bateson asserted that *changing the rules* by which international games are played is a way out of the presently insane relationships of violence and threat. (Bateson, 1972, p. 476) Let's do it! Something more fun!!

One is continuously forming a greater whole with language.

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Three Positive Points

By Richard S. Marken (10459 Holman Ave., Los Angeles, CA 90024). Copyright 1989 by Richard S. Marken.

Control theorists do not dislike opposition theories or theorists. However, advocacy of control theory can be perceived as hostility toward opposing points of view. Control theorists don't mean to be unfriendly; it's just that behavior doesn't work the way conventional theories say it works. It is nature that is unfriendly, not control theorists. Nevertheless, friendly people like Brian Midgley (in his 'Rejoinder" in CC #14) imagine that there should be some common ground between, say, behavior analysis and control theory, and feel rebuked (and rightly so) when some wise-guy control theorist like me implies that there isn't. But, unfortunately, there is no more common ground between control and conventional behavior theories than there is between helio- and geocentric theories of the solar system. One of the models fits nature better than the other, and it is considered (for the moment) correct.

Control theory is more than just a way of talking about behavior. Control theory is a model of how behavior works. Thus, it doesn't matter whether or not it is possible to find components of the control model that are verbally interpretable (from someone's perspective) in terms of another, more conventional theory. The question is: "Which model explains what we observe?" Control theorists argue (and demonstrate) that the answer, when we are talking about the behavior of living organisms, is a model based on control theory.

Nevertheless, I believe that some control theorists have been guilty of taking an unnecessarily confrontational approach to presenting their point of view. I count myself as a premier offender. In several research papers, I have developed control theory in terms of its opposition to conventional theories rather than in terms of what it tells us about behavior. As a first step toward changing the emphasis of my own discussions, I submit the following three positive statements about the application of control theory to the behavior of living things.

Control theory is about control. The phenomenon of control is also called "purpose," "goal-seeking," and "intentional behavior." Most of the events that we call "behavior" are examples of control. Control is a phenomenon; control theory is an explanation of how that phenomenon occurs. If you are not studying control, then you don't need control theory. (Cf. my article on this topic in *Behavioral Science,* July 1988.)

The main goal of research on living control systems is the discovery of controlled variables. Understanding behavior means knowing what variables are being controlled, how they are controlled, and why.

3. Control is done by the organism, not by the environment. Organisms control the environment, not vice versa. There are no controlling variables—variables that control behavior. There are, however, controlled variables—variables controlled by living organisms.

Note that these statements say nothing about control theory per se. They do speak to, first, why one might be motivated to apply control theory to behavior at all (beyond the demonstrated application of the theory to artificial systems like op amps and thermostats), second, what one would want to find out about behavior from the point of view of control theory, and third, the natural source of control. A discussion centered on these three points might be a good start for those interested in the study of behavior from a control theory perspective. They are the basis of a science of living control systems.

Listening

Raindrops falling, gently falling
on your cheek and mine;
Flowers blooming—buttercups,
violets, Queen Anne's lace;
Where has the emotion gone?

Firetrucks scooting to anywhere,
here and now... then and there;
Nameless cans and broken glass,
newspaper for the old man's head;
Where are you when I need you?

In the castle, two are sleeping,
the butler sits, the maid is weeping;
Watchdogs guard the sacred vase
as outside a storm is brewing;
There are no questions... and no answers.

Redwood trees, gently swaying,
two are swimming, talking, playing;
Then three, then four and seven,
dancing, singing, statues turning;
When will it begin again?

I do not know... oh! yes I do:
not what, nor why, nor where;
But, *when* I say you, or we,
or *thou,* the world stands still;
No... wait! It moves—
        thinking...
                feeling...
                        listening.

                                    R. Lori

A Precursor to Cybernetics

Excerpts from *Automaton, or the Future of the Mechanical Man,* by H. Stafford Hatfield, published in 1928 (in the 'Today and Tomorrow" series) by Kegan Paul, Trench, Trubner *&* Co., Ltd., London, and E.P. Dutton & Co., New York. This 100-page book is not in many libraries in the U.S.; the Library of Congress does have a copy (call number TJ215.H3).

14: An automaton, by analogy with the human model, should consist of three parts: limbs to work with, senses to perceive what it is working with, or what result it is producing, and a brain to regulate the action of its limbs in accordance with the perceptions of its senses.

21-22: This field of work is at present in a most primitive stage of organization, compared with that of other branches of technical science... While the design of prime movers, electric generators, machine tools, and so forth has been elucidated and written about theoretically and practically, there is hardly any literature available concerning the design of such matters as electric relays, contacts, complicated mechanical motions. Nothing at all is published concerning the relative merits and dependability of all the various alternative devices which may be used to solve an automaton problem... in more developed branches of engineering the relative merits and demerits of alternatives can be estimated from theory and experience before work is begun—No such possibility exists at present in the design of automatic controls...

25: Perhaps the simplest everyday example of a true automaton is the is the gramophone motor. Its function is to turn the disc at a constant speed, in spite of varying friction, strength of spring, and other causes. In it we find a very simple instrument, consisting of a pair of spring governor balls, the divergence of which is a measure of the speed of the motor. This device "perceives" any change in speed, from whatever cause. It acts upon a brake applied to the motor, presses this on when the speed increases, and takes it off when it decreases. This is the brain of the arrangement, which controls the limbs, the motor.

26: ... one fundamental kind of automaton... may be said to wait for slight trouble, and then immediately take steps to correct it.

27: ... it is possible to construct automata which do not wait for trouble to occur, but, instead, anticipate it. Such automata perceive a change in conditions, such as size or composition of material, and immediately adjust the tool so as to meet correctly the changed conditions.

48: When... we tackle the question of the recognition by the automaton of a number of similar but not identical forms, the only solution we can think of is one which simply enlarges the repertory of the automaton by a number of *definite* shapes. It is, however, pretty certain that this is not Nature's way. The mental process is no doubt a sort of working to limit gauge. The same shape is recognized as the same until distortion has proceeded in various directions up to a certain point. But in the mental process, the shape appears in some way to be taken out of the three dimensions of space.

62-63: In all the principal countries, the greatest efforts are being made to devise apparatus [for pilotless planes]... The problem is, of course, to steer a plane correctly by automatic means to any desired objective, in order that it may deposit there as much high explosive or poison gas as it can carry. Merely setting the plane on a straight course will not do, for the variation in the direction and strength of the wind would inevitably destroy any accuracy of aim. Efforts are being made to control from the ground or the air such pilotless planes... work of this kind is so much more attractive to the inventor than work in conjunction with financiers out for quick profits, that is sure to occupy some of the very best brains available. Methods of fantastic originality and difficulty can be tried out, regardless of expense. The moral aspect of the matter will play very little part. After all, the work of the inventor of automatons is in any case to abolish unnecessary human beings.

89-90: Will great automata feed, clothe, house, warm, light, and amuse a population from which all but the brains that can understand, and the skilled hands that can tend, have been eliminated? ... we may well tend to a condition of affairs when scientists will be a kind of caste apart, pursuing knowledge for its own sake, in directions determined solely by intrinsic interest... Because all universities are now teaching engineering, it is popularly supposed that science and practice are coming nearer together, whereas in truth all that is happening is that engineers are being trained in these institutions without a thorough scientific foundation, in the formulae of existing practice, and then sent out in the world without the equipment for applying to their practical work the discoveries of pure science.

91: If... the whole weight of humanitarian influence were directed towards the substitution of automata for all forms of monotonous hand-labour, great progress might be made. The lot of workers in the field should be made as attractive as that of the pure research worker.

Call for Papers

For "Connections," the 1989 Meeting of the American Society for Cybernetics, in Virginia Beach, Virginia, November 9-12 (Pre-Conference Tutorial: November 8).

Extensively, cybernetics can be defined by the connections it evokes. Modern cybernetics was born 40 years ago in a series of intense, interdisciplinary conferences on "circular causal and feedback mechanisms" which drew on anthropology, electrical engineering, psychology, biology, and philosophy, among other fields. From the conversations and controversies that ensued arose the ideas of organizational closure, self-reference, attractors, and other recognitions of essential circularities in complex systems. Their influence has been felt in areas as diverse as immunology and political science, family therapy and information systems, education and ethics.

Intensively, cybernetics could be defined as the search for "those notions which pervade all purposive behavior and all understanding of our world," as Warren McCulloch wrote of those early discussions, and the concern with the tenability and consequences of our conceptions of knowing, causality, and the laws of nature.

The challenge and excitement of cybernetics lies in the difference between these two definitions, and the bond. It is to go beyond philosophizing and tool-building alike, to embrace distinction, not be engulfed by it, and to let creativity and rigor inform, not exclude, one another.

These are the concerns of the conference:

1. What questions does a cybernetician ask, and how are these understood by workers in other fields?

2. What are the lessons of more recent connections for understanding understanding?

3. What social and scientific processes underlie change (or progress?) in cybernetics as a field?

They will be articulated in a series of plenary sessions on:

Self-organization, computer technology, & management

The phenomena of language in machine, animal, & organization.

Modeling as definition, reflection, and intervention. The social construction of knowledge.

Learning & helping.

Process. To explore connecting in conversation, the conference will include *special issue seminars* that will each consider a particular topic in greater depth and include a packet of readings to be mailed to participants before the conference; an ongoing *participatory laboratory,* stocked with mechanical and electronic tools for modeling, experimentation, and expression; "Questions of Cybernetics," a special full-day *pre-conference tutorial*, linked from the conference to sites around the country by interactive television; and a *cybernetics* fair and other unscheduled time in which to pursue conversations and respond to the concerns that arise during the conference.

Program. To encourage and facilitate preparation on the part of presenters and other participants, we will publish a Conference Program, including abstracts for each presentation and workshop, and theme statements for each plenary session. The Program will be mailed to conference registrants in the early fall.

Students and new participants. To broaden participation, we plan to provide a limited number of travel scholarships and awards. Please contact the organizers at the address below for further information.

Deadline. We invite your participation. Proposals must be received by May 1, 1989. They should include:

1. A title and an abstract (150-300 words).

2. For seminar proposals *only,* a short reading list (30-50 pages).

3. Format (e.g., paper presentation, seminar, performance, workshop, exhibit, or demonstration) and corresponding technical and audio-visual requirements.

Since items 1 and 2 will be published in the Conference Program, they must be submitted in camera-ready form or in one of the following computer-readable formats:

5.25" or 3.5" MS-DOS 3.3 compatible floppy disk; ASCII, Microsoft Word, Wordperfect, or Wordstar files

3.5" Macintosh compatible floppy disk; text, Microsoft Word, or MacWrite files

Please send proposals to:

Christoph Berendes
Center for Cybernetic Studies in Complex Systems
Old Dominion University
Norfolk, VA 23529-0248

Phone: 804-683-4558
Internet: chrisber@well.uucp
Usenet: {hplabs,sun}!well!chrisber

An Invitation

From Marshall Scott Poole, Chair, ISA Information Systems Division, Dept. of Speech Communication, University of Minnesota, 317 Folwell Hall, 9 Pleasant St. S.E., Minneapolis, MN 55455.

I am writing to invite you to join the Information Systems Division of the International Communication Association. I think that you will find the division as stimulating and enjoyable as I do.

The Information Systems Division is concerned with information, language, and cognitive systems. Its central goal is promoting the development of general theories of complex systems and quantitative methodologies for communication research in a variety of domains. This focus brings together people with a wide range of interests and specialties. Member interests include: studies of information flows, the human interface with communication technology, and life in an information society; cognition, including information processing of direct and mediated communication and the construction of cognitive models; artificial intelligence applications in logic, language, and reasoning; modeling and study of interaction systems. Members have pioneered analytical techniques in areas of network analysis, information theory, structural modeling, interaction analysis, content analysis, and linguistic data processing systems. Issues in the philosophy of science, cybernetic epistemology, therapy, and ethics are regular concerns as well. The Division sponsors the journal *Behavioral Science* and publishes *Systemsletter* for its members.

It might also be interesting to note that the Information Systems Division has a strong international component, grounded as it is in the study of systems.

For more information regarding membership, or if you have any questions, please contact me at the address given above.

Eighth International Congress of Cybernetics and Systems

This conference is scheduled for June 11-15, 1990, at Hunter College, City University of New York. It will provide a forum for the presentation and discussion of current research, with specialized sections focusing on computer science, artificial intelligence, cognitive science, biological cybernetics, psychocybernetics, and sociocybernetics.

Anyone who wishes to organize a symposium or section for the conference should submit a proposal (including sponsor, subject, potential participants, and very short abstracts) as soon as possible, but not later than September 1, 1989. All submissions and correspondence regarding the conference should be directed to:

Prof. Constantin V. Negoita
Cybernetics and Systems Congress Chairman
Dept. of Computer Science
Hunter College
City University of New York
695 Park Ave.
New York, NY 10021

12th International Congress on Cybernetics

The International Association for Cybernetics is organizing this conference, to take place August 21-25, 1989, at Namur, BELGIUM. For more information, write to the Association Internationale de Cybernétique, Palais des Expositions, Place Andre Rijckmans, B-5000 Namur, BELGIUM.

Systemic Therapy: A European Perspective

This recently published book was edited by Jurgen Hargens. It includes essays by Italian, Czechoslovakian, Norwegian, and German therapists who have been influenced by Humberto Maturana, Niklas Luhmann, and Luigi Boscolo and Gianfranco Cecchin. For a copy, send $20.00 U.S. to: Verlag Modernes Lernen, Hohe Strasse 39, P.O.B. 100 555, D-4600 Dortmund 1, FEDERAL REPUBLIC OF GERMANY.

A Turn in the Conversation...

... is coming in the near future. Beginning with the first issue of *Continuing the Conversation* published in 1990 (issue #20), at the latest, the focus of this newsletter will return to Gregory Bateson. I have become weary of editing (literally) pounds of cybernetic foolishness to extract a few ounces of wisdom. Some claim it is better to focus on ideas than individuals—but that depends on the particular ideas and individuals, and most of the ideas submitted for publication in *CC* over the past couple of years have fallen far short of Bateson (his presence, his writings, his wake) with regard to encouraging "ever more beautiful" questions. I think CC can best facilitate the asking of such questions by spreading the news on current Bateson studies, by aiding cooperation among Bateson appreciators, and by facilitating access to Bateson-related materials. Accordingly, I plan to publish bibliographies, checklists, corrigenda, queries, requests for aid and collaboration, interviews with acquaintances of Bateson, and *brief* articles by Bateson scholars. In particular, I hope to publish a number of Bateson anecdotes before they are lost forever. If you can help in these endeavors, let me know. In the three remaining 1989 issues of *CC*, I'll provide more details on plans for the "new" *Continuing the Conversation: A Newsletter on the Ideas of Gregory Bateson.*

Greg Williams

IF YOUR ADDRESS IS CIRCLED IN RED, PLEASE RENEW IMMEDIATELY. NO SEPARATE RENEWAL NOTICE WILL BE SENT!

Continuing the Conversation

A Newsletter of
Ideas in Cybernetics

The Elysian Dialogs

By Tyrone Cashman (220 Redwood Hwy., #130, Mill Valley, CA 94941). Copyright 1989 by Tyrone Cashman.

Being the narrative of a mythic journey of an Epistemologist to the Elysian Fields of the Underworld.

As a final test and confirmation of his theory of closed system knowers, well-known neurobiologist Humberto Maturana, now middle-aged, has undertaken a journey to the Classical Underworld, hoping to engage in dialog with the great epistemologists and ontologists of the past.

We find him at the point in his journey where, having *been* guided to a hidden cave, the entry to the realm of the god Pluto, he has passed through it and taken the long underground path to the Elysian Fields.

As Virgil described them, the Elysian Fields—although reached through the entrance to the underworld—are a spacious and beautiful region of sunny meadows and woods, comfortable and lightsome in *every* respect, where the Noble Dead gather and enjoy indefinitely a reward consonant with their lives on earth.

Professor Maturana is at this moment making his way along the shadowy paths that lead to the blessed region. As he continues, the light before him grows brighter and finally he steps out into the open. A sweeping vision of rolling hills, streams, copses and woodlands, meadows and small lakes spreads out before him. He sees coming up the hill toward him a stocky, balding, bearded man in a Greek toga, with his arm raised in greeting.

SOCRATES: Welcome, Professor Maturana! You have found your way to the realm of the Noble Dead. There are many here, whom you know by reputation, who will be happy to discuss epistemology and ontology with you.

MATURANA: Thank you. Are you Socrates?

SOCRATES: Yes, I am. And eager am I to hear about the key issues in neurobiology and perception in these last years of the 20th century. Unfortunately, at this moment I can only stop briefly to greet you.

But I notice that the Christian zoologist from the 19th century, Philip Gosse, is coming up the hill here to join us. He told me he was hoping to have some time with you. He is quite excited about your theory. I myself will seek you out later for a good discussion. Farewell for now.

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GOSSE: Here you are, at last. I am so glad to meet you. You are Professor Humberto Maturana, aren't you? I was told that you would be travelling this road. I have wanted to meet you ever since I heard about your fascinating theory. You know, I am a biologist, too. And I wrote a book defending the literal interpretation of Genesis against that scurvy Darwinian crowd.

There are very few reputable biologists in your time, I am sad to say, who honor the brilliance of my reconciliation of (a) the fossil-rich geological strata indicating vast aeons of biological time in the past with (b) the literal truth of the *Bible* that the earth is only 4000 years old.

You see, that is why I was .so excited to hear about your theory, since you must believe the same thing I do.

MATURANA: How can you possibly think that? You, sir, are a Fundamentalist. How could there be any similarity in our thinking at all?

GOSSE: Please, don't you look down on me, too. That is what all the modern biologists do. My reconciliation is really quite subtle. Let me lay it out for you.

For your sake I will call it a hypothesis, all right? Given the hypothesis that God created the world just 4000 years ago, in a series of six days, how would He create it? Would He create it with somewhat different designs than those which it would take on later? For example, would God give Adam and Eve navels? Well, of course He would. That's the basic design—Would He create the adult animals that learn to hunt from their parents—would He create them knowing how to hunt or not? Of course, He would create the adults knowing how. He would create them *as if they had a past.*

You see, that's my point! Everywhere He created something, He created it "in mid-stride" as it were. If there was no glucose in the bloodstream until they started eating and metabolizing, it would be nearly impossible for animals to survive in the first hours of creation. They even must have had fecal matter in the large intestines. And trees. He created fully grown trees. Did they have annual growth rings? Of course they did.

You see how the argument goes? Well, the same is true for the geological strata, for the dinosaur bone prints and the trilobite shell prints in the rocks. God created the world *as if it had* a *past.*

MATURANA: Quite ingenious, sir, I admit. But what has that to do with me? If you have read our book, *The Tree of Knowledge*, you know that I believe in evolution and discuss it extensively there.

GOSSE: Yes, I know you do. And that puzzles me. I don't see how you can do that. Isn't it true that in your ontology nothing exists except what is distinguished by a human observer in language?

I have several quotes from your works to that effect:

"Nature, the world, society, science, religion, the physical space, atoms, molecules, trees, ... indeed all things, are cognitive entities, explanations of the praxis or happening of living of the observer, and as such, as this very explanation, they only exist as a bubble of human actions floating on nothing." (1)

"I claim that the *ding an sich* cannot be asserted or accepted as having any kind of existence because existence is bound to the distinctions of the observer, and to accept the existence of what cannot be distinguished has no sense." (2)

.. we accept that... *nothing pre-exists its distinction.* In this sense, houses, persons, atoms or elementary particles, are not different." (3)

Those italics are yours.

MATURANA: Yes, that is what I say. So what?

GOSSE: Well, logically that means that existence is dependent on the distinctions made by languaging observers. Therefore, before there were languaging observers, no biological world existed, no world of any kind could exist. Well, that's what we Fundamentalists say. Or rather, we give the world five days existence longer than you do, but let us not quibble about 120 hours.

Now, since I know you to be a subtle mind from reading your materials, I assume that you will take the same tack that I do. That when the world comes to exist through being distinguished by observers in language, it comes to exist as *if* it had a past. Neither you nor I can deny the presence of fossils in the geological strata. So you must hold to my theory, mustn't you?

MATURANA: Look, when we explain the world now, in the happening of living, we explain it in terms of a long evolutionary stream of organisms from which we ourselves have evolved. That is a scientific explanation. And that explanation brings forth the evolutionary stream. Evolution is not a problem for my system.

GOSSE: Yes, I understand that is your position. But that also means that until now, or at least until Lamarck and Darwin's time, evolution had never occurred. In your theory, an observation in language, now, brings forth the fossils, and the explanation brings forth ancient dead dinosaurs, now. But it does not bring forth *living* dinosaurs.

Since there were no human observers-in-language to distinguish dinosaurs when dinosaurs were supposed to be alive, 65 million years ago, it follows that, in your ontology, no living dinosaurs ever actually existed. They only exist *now* as an explanation of our present praxis of living. They never did exist *then.* Don't you see?

MATURANA: I'm sorry, Mr. Gosse, you still don't understand. You are right that in my theory, nothing pre-exists its distinction. But I have distinguished in my evolutionary explanation the whole stream of evolution all the way back to the Big Bang. So now it exists. What's the difficulty?

GOSSE: I actually have no difficulty, Professor. What you say is quite parallel to what I say in my book, *Omphalos,* and it makes me content. Until human observers-in-language came on the scene, there was nothing. Nothing pre-existed the distinctions of observers-in-language. As Adam and Eve observed the world, they noticed that it was designed as *if* it had a past. And they could explain it that way, just as you can. But, in both your hypothesis and our Fundamentalist convictions, before there were human observers-in-language, *there was nothing.*

The only thing you are a little confused about is the nature of *time.* You seem to think that your present "explanation" can bring living dinosaurs into existence *in the past,* retroactively. You say that only the present exists. But as we all experience in the praxis of living, time passes. All of the other scientists would say that the fossil dinosaur bones we see today were once living dinosaurs in a time that was for them, then, "the present." And in that present there were no human observers. So you cannot hold, thank goodness, the theory that dinosaurs ever really lived. We agree, you and I, that before human observers, there was nothing. Nothing existed at all.

You are the only contemporary biologist who appreciates that the universe is utterly human-centered.

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Continuing his journey, Maturana comes to a turn in the road and sees a hillside on which a large gazebo stands. As he approaches, he discerns inside it a table with two men sitting. A large pot of tea, covered with a tea cozy, rests on the table. By their dress, Maturana decides the men are an Anglican bishop and a 17th century French scholar. The bishop hails Maturana.

BERKELEY: Ah, here you are at last. We were told of your approach, and René and I have been chatting about this issue of perception ever since. We have different approaches to it as you know, but there is a similarity, too. In fact the three of us, Professor, came to something very similar and went three different ways.

DESCARTES: George, since I initiated this type of epistemology, let me present my ideas first. Professor... may we call you Humberto?

MATURANA: Yes, of course. I would be honored.

DESCARTES: As you probably know, I decided I had to doubt everything if we were ever to clear the tables for a new set of philosophical assumptions. The old ones, by my time, had been robbed of their credentials by Galileo, as I'm sure you recall. I methodically set out to doubt everything I could possibly doubt. In doing that, it was easy enough to doubt that there was a "real world" independent of my thoughts, to which my thoughts related. The thoughts were there, but that didn't mean there was any world outside that they matched. However, I soon saw that that left me stuck. The one thing I couldn't doubt was that I existed—because the thoughts existed, you see. But I couldn't go anywhere from there. I was alone in the universe—or more accurately, alone without even a universe.

In time I saw that, although I had the firm starting point I was looking for, I couldn't go anywhere with it because my perceptions gave me no purchase on a world outside myself. In fact, I was in quite a tough spot until I remembered St. Anselm's argument for the existence of God, which I learned as an adolescent when I was a student of the Jesuits. Well, that got me out. Once I could prove the existence of God from my own thoughts, I could prove that such a God would be good and all powerful, and that such a God would not deceive me. Therefore, my impression that my perceptions and thoughts relate to a world outside my own mind had to be true. Otherwise this God would be deceiving me.

That's how I got the world back. But it was nip and tuck for a while.

BERKELEY: Very good, René. Thank you. My trajectory was different, but crossed yours at a couple of points. I was concerned with the irreligion of people, both in my flock in Ireland and generally, and after examining the root of it, I decided that it was essentially a kind of materialism which kept people from being sufficiently spiritual. I wondered if it wasn't possible to be rid of matter once and for all. So I tried it out. And it seemed to work. I found that if I dropped the idea of the material world altogether, I hadn't lost too much—at least not so much as to be unacceptable. I coined the phrase *esse est* per-dpi, *to be is to be perceived,* almost as an heuristic principle—and tested what would happen if I held it. Well, as the inferences multiplied, I got in some trouble, but like René, I was able to get myself out of it. Here's what happened. With my principle, I was able to let go of the material world altogether and reduce all existence to the perceptions of a perceiver. I was very much like you in this, Humberto, as I'm sure you understand. But I got into a fix. If my perceptions were what made a thing

be, what happened to it when I wasn't looking? Well, maybe there was somebody else looking, and thus holding the thing in existence. (I still don't know how I handled the idea that two people could see the same thing.) At the time, what I was concerned about was what kept a thing in existence if there wasn't anybody watching it.

In particular, I was concerned about the history of the world. I had been in some of the Irish caves and seen the fossils and all that, and it was clear that the world had a history that predated human perceivers. (You see, I am not a Fundamentalist.) This was one problem. The other problem was what happened to the flowers in my garden when no one else was there and I had turned my back on them.

Then it came to me. I realized that although I wasn't watching them, and no one else was, that God was watching them and God doesn't blink. The nice thing about that is that God was around before we were, so He could have been watching the fossils when they were living creatures, and it all fell into place. But, you know, I don't see how it can be done without God.

That brings me to your theory. You are all very modern and all that, and you know a great deal about the nerves and brains of creatures and humans and all that. But still, I'm devilishly curious how you cope with things like "common perceptions."

I gather that you do it through your concept of languaging." That would help me, but I am stuck on the criticisms of my theory that people made, which I got out of through my concept of God. How do you manage to give some solidity to a world that is shared? Or do you have a world that is shared? As I read your theory, without a concept of God you seem to be sunk in what could be called a "relativized relativism." My theory was a relativism. That means that all being was relative to perception, not independent of it. But the perceptions of God are so powerful and constant, and in fact, eternal, that they put a foundation under everything after the old foundation of an independently existing universe has fallen away.

You don't seem to have a foundation to put under existence after you made it depend on perceptions. So that's why 1 call your theory "relativized relativism." The feeling I get when I read your writings is that there is no ground to support anything, that you slide either directly into a terminal solipsism or your theory leaves individual perception with no ground or base—and, I must say, common perception based in languaging is extremely tenuous, very tenuous indeed.

I don't see you even addressing the issues that were so vivid to us, your predecessors: 1. How can one individual see and hear another individual enough to communicate? 2. If my perception of you is totally generated by my act of distinguishing, wouldn't I have to be God for my generating of you as a perception in my phenomenal world to be powerful enough to endow you with interiority, i.e., with your own thoughts, feelings, desires, and perceptions of the world?

In other words, are you, entirely as a perception in my phenomenal world, endowed with thoughts, feelings, and perceptions of your own?

MATURANA: Your Excellency, I am flattered that you have taken the time to try to know my theory. But, as you speak, I realize that there is a large difference between my theory and yours, more than I had expected from my reading in philosophy. I don't speak about interiority. The way I frame my theory of the operationally closed nervous system, I don't discuss thoughts, feelings, even perceptions much. They only exist as explanations at the higher levels of recursion of consensual coordinations of action.

Languaging occurs not inside the nervous system, or the mind as you would say, but outside, between structurally coupled organisms. Objects arise out of language, and human observers are objects in my theory, so everything arises out of language. You are correct, language functions in my system in

the role that God-the-observer plays in yours. In the late 20th century, it is no longer possible to appeal to God as an ontological skyhook, nor would I be interested in doing that.

BERKELEY: Hmmm. I must think about this further. Languaging is the action of human organisms, and human organisms arise out of languaging... hmmm. Let's see, there must be an ontological foundation here somewhere... hmmm... such a bright man.

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DESCARTES: While George is ruminating on your response, Humberto, let me ask you a question that has been puzzling me. I was told by a recent visitor that in some writings about the "new paradigm" in science, it is proposed that you and your colleague, Dr. Varela, are the first scientists to overcome what is called the "Cartesian" split, between mind and matter, between knowing and being. But, clearly, this is only because the authors have not read your works carefully. Don't you agree?

MATURANA: No, I don't. I think that is quite precisely what we have done. I am proud of that achievement.

DESCARTES: Forgive me, Humberto, but I must disagree. You have simply *relocated* the split. And it is only slightly less radical than my own. You had to do this. The fact that you did it shows that you are a decent theoretician.

You see, you started with my starting point: an exaggerated doubt about the validity of perception as giving access to an independent world. This starting point of mine left you in grave danger of solipsism, as it did me.

You are honest and clear-minded enough to know that, whoever locates language, and therefore knowledge, and therefore existence *inside* an operationally *closed* nervous system gets sucked into the whirlpool of solipsism. So you claim that languaging has no home in the nervous system. It exists in the *space between* organisms. This would seem to save you from the solipsism your other claims would sink you in.

But to do this, you have had to come up with another "Cartesian" split, if I may. Mine, as you recall, was between mind and body, two different substances, which joined (I created a sort of isthmus for them) at the pineal gland, so that they could cooperate.

MATURANA: There is nothing like that in my system.

DESCARTES: May I read from your works?

MATURANA: Go ahead.

DESCARTES: "Indeed, the operation of the nervous system and the actions of the organism take place in nonintersecting phenomenal domains realized by orthogonally related structures." (4) You see, although you admit the interiority of *cognition*, in order to do so you have had to denature it: "Cognition as a biological phenomenon takes place in a living system as it operates in its domain of perturbations, and as such it has no content and is not 'about' anything." (5) Then, to avoid obvious solipsism, you are forced to locate language *outside*. This leaves you in the embarrassing position of having to say that "cognition " (for heaven's sake) has no content, a judgment which flies in the face of everyone's experience in the praxis of living.

So, you are left with "languaging" outside the organism in the domain of actions of organisms, and a "cognition without content," inside. And then you say that the operation of the closed nervous system and the actions of the organism take place in *non-intersecting* phenomenal domains.

Of course you must say this, because you insist that only an outside observer can bring the behavior, the actions of any organism into existence, while the organism with its own nervous system operates with no awareness whatever of an outside world.

Do you see my point?

In my theory, I ended up loading everything—cognition, thought, feeling, meaning, even the evidence for existence—into the *mind* of the composite human being, leaving very little outside. You have done the opposite: you say that the nervous system is operationally closed, but before we can object, you say that's all right because there's nothing important in there. You have emptied out the nervous system (except for contentless cognition) and spread everything, including the cause of existence, outside into the air between organisms.

But your human being is still split down the middle, just like mine. There is the nervous system which "operates as a closed network of changing relations of activity between its components," and there are "the actions of the organism." The two of them exist in "non-intersecting phenomenal domains realized by orthogonally related structures."

You even have your own version of my pineal gland, you fine man, "orthogonally related structures"! What a beautiful, 20th century, way of phrasing that tricky sort of connection between non-intersecting worlds. It has a mathematical, fourth-dimensional, flavor to it. I like that. If I were writing my theory today, I might use your phrase.

But, you must know, Humberto, that over the centuries many have claimed that our position, yours and mine, is a mistake. Some say that the greatest loss is this: when I was done splitting the human mind from the material world, the outside material world was dead. In your case, they would say that when you are done splitting the nervous system from the world, operationally and informationally, the independent world ceases to exist. If they compared us, they would probably say that my split was bad, but yours is worse.

Maturana, stunned by Descartes' description, looks out the gazebo window and sees Socrates hailing him from the path below.

Socrates: Hello, Professor. It's a pleasure seeing you taking advantage of your time here, talking to all these good heads. Do you mind if I take him away from you, gentlemen, just for a while? There is quite a demand for him, and I insist on my own leisurely encounter, before the others close in.

Maturana follows Socrates down the hillside to the main path. The path opens out onto a very large meadow.

Socrates: Isn't this an extraordinary place! Having the world's best minds around to talk with all the time. It keeps one's intellectual tools clean.

By the way, in your system of neuro-idealism, I guess I would call it, is it possible for two observers to observe the same thing?

Maturana: Yes, that is our experience in the praxis of living.

Socrates: Fine, let's explore that a little. As we walk along, let us take an example. Let's see... look, there's a fox over there sunning himself on that grassy knoll. We don't frequently see foxes in full daylight like this. And that's a particularly handsome one. Let's take the fox.

You say, as I understand it, that your nervous system is operationally, I take that to mean informationally, closed. So, the fox over there that you see is the result of your distinctions as an observer-in-language. There is no fox-in-itself resting and licking its paws over there, only the fox that arises, that comes

to exist, when you, Humberto, distinguish it. In fact, the entire existence of the fox is the simple result of your distinguishing it, of your cognitive act.

Do I have it right?

Maturana: Yes, roughly.

Socrates: Now, I have done the same thing. A fox has been brought forth by my distinguishing it, consonant with structural changes in my operationally closed nervous system. The fox, according to your theory, *exists* because I have distinguished it. Humberto, tell me please, do you and I see the same fox?

Maturana: Socrates, you left out the important phrase. You distinguish that fox *in language.*

Socrates: Ah yes, we each bring a fox into existence as observers-in-language. I remember now that you are always careful to express it that way. But still, do I bring one fox into existence and you bring another?

Maturana: I would say that as long as we are languaging about the fox, as long as we have consensually coordinated our consensually coordinated actions... then the fox that is brought forth by you, as observer, and the fox that is brought forth by me, as observer, are the same fox, yes.

Socrates: Just so. And language is very important in this?

Maturana: Of course. It is our distinguishing in language that brings forth the fox.

Socrates: Now Humberto, look down ahead of us on our path, about 300 paces away. Do you see that man coming toward us, lost in thought? His eyes are looking at the ground as he walks. He hasn't noticed anything around him for several minutes.

Now, did you see that? He just looked up. His gaze is sweeping across the meadow. Now his head has stopped. He is looking directly at the grassy knoll. The fox is now sitting up and looking at the man. The man is watching the fox. Now the fox stands up, and now he is trotting off toward the woods. The man's head is turning and his eyes are following the fox as it trots across the meadow into the woods. Now the fox has disappeared in the woods. The man's head turns back and he starts walking up the path, again, in our direction.

Now tell me, Humberto, did that man see the same fox that we saw?

Maturana: No, he did not. It is you who distinguish him as an observer of a fox. His nervous system simply received some perturbations, and it reacted according to its own inner dynamic. He has no way of knowing anything outside himself.

Socrates: But did the man see the fox as we did?

Maturana: It is only within your cognitive domain that the man saw a fox. It is you, the outside observer, who distinguishes that the perturbations of his operationally closed nervous system are the result of a fox sitting on the hill. He could not be aware of having seen a fox, but only of perturbations to his nervous system, if there were no observers-in-language. As I wrote in a recent summary of my theory, "Ontology of Observing": "Objects arise in language as consensual coordinations of actions that in a domain of consensual distinctions are tokens for more basic coordinations of actions, which they obscure. Without language and outside language there are no objects." (6)

SocRATES: Do you mean, then, that not only did the man not see the *same* fox we did (which I was prepared to hear), but he did not see a fox at all?

MATURANA: Cognition as a biological phenomenon takes place in a living system as it operates in its domain of perturbations, and as such it has no content and is not "about" anything.

SocRATES: Well. This is somewhat confusing.
But wait, Humberto, the subject of our discussion is coming up upon us now. Let us be silent, make no gestures or facial movements, and see if he gives us some indication of having seen the fox.

STRANGER: Hello, gentlemen. Say! Did you see that beautiful red fox? He was sitting over there on the knoll, just as pretty as you please, looking at me. Then he stood and trotted across the meadow into the woods. You must have seen him.

SocRATES: Yes, we did actually. But, unfortunately, you didn't—until just now, perhaps, when you began languaging with us about him. Your fox could not have begun to exist until then.
Now it is a bit confusing, because a fox over there on the knoll began to exist as soon as my colleague here and I began to distinguish him in language. But, most likely, it wasn't the same fox that you are now talking about seeing back there on the same knoll at the same time we were distinguishing it into existence. Because we were looking at it and observing it in language and you were not. So, for you, it wasn't even an object. I'm sorry, sir, but without languaging about it, you can't see anything at all.
Isn't that right, Humberto?

MATURANA: Technically that's true, but you are trying to make my position sound ridiculous.

SocRATES: Please don't be offended, my dear Humberto. Remember, I have a centuries-long reputation for trying to clarify people's thoughts by rephrasing their positions as they sound to me.
But if my point is technically true, please explain to me just how this "languaging" is possible.
Let me look at your book... yes, here it is, you define language as "a domain of recursive consensual coordinations of actions." (7) We are coordinating our actions, a very high level event, wouldn't you say, coordinating our actions? It makes me think of military maneuvers, or a team sport at our Olympic games. Isn't it necessary for you to see me, or hear me, in some way in order to coordinate actions with me? How would you know how my actions, my gestures, are moving if you can't see them?

MATURANA: I *don't* know how your actions and gestures are moving. Only a third party observer could know that. It is an outside observer who brings the consensual coordinations of our actions into existence.

SocRATES: Yes, I guess that is how I understood it. For me, individually, the environment simply does not exist, unless I am lucky enough to have an outside observer observing both me and an environment impinging upon me or being affected by me.
Let's take another example, a close personal one to me. I remember once returning from a long Athenian military campaign. My wife and I had missed each other greatly, and our reunion that evening was especially tender and delightful. Is it true that in your theory, those sensitive mutual caresses, which I will remember forever, did not exist unless there was

a third party observer watching her respond to me and me respond to her?

MATURANA: Well, actually, yes. This is the way I state that: "It is only for an observer who sees two or more interacting organisms in his or her praxis of living, that the sensory-effector correlations of these organisms appear recursively involved with each other in a network of recursive sensory-effector correlations constituted through the orthogonal interactions of their nervous systems." (8) Or, stated more simply, "Behavior is not something that the living being *does* in itself (for in it there are only internal structural changes) but something that we [outside observers] point to." (9)

SocRATES: But how exactly would such an outside observer see the two of us, if even we two are unable to see or feel each other's mutually responsive caresses? Any third party observer would be as locked into his or her own nervous system, unable to observe my wife and I relating, as my wife and I were unable to know our interactions.
It is really the old problem of solipsism, my friend.

MATURANA: I am happy you brought up the question of solipsism, Socrates, because I have a good answer to it. We say in our book that "solipsism... [is] the classic philosophic tradition which held that only one's interior life exists. And it is a trap because it does not allow us to explain how there is due proportion or commensurability between the operation of the organism and its world." (10) My colleague and I point out that the whole problem of solipsism comes from a failure to make a proper "logical accounting." It comes from confusing two domains.

SocRATES: Could I interrupt for just a moment, Humberto? I don't understand what the trap of solipsism has to do with "commensurability." The solipsistic problem, as we classical folks understand it, is how the organism or knower can know anything *except itself*. The problem of solipsism is how knowledge of *the other* can ever occur. 'Due proportion" or "commensurability between the operation of the organism and its world" is never a problem for a classical solipsist. In fact, commensurability is to be taken for granted since the organism's "world" is not outside of, or different from, the organism itself. It is not *other*. Why should commensurability of an organism with itself be a problem?

MATURANA: But, Socrates, we have already discussed the fact that, in my theory, there is nothing much inside the organism. Cognition has no content, and is not about anything. The nervous system just goes through its pre-determined structural changes when perturbations occur. That's all. It has no awareness *of anything* at all. The outside observer brings the environment and the other people into existence.

SocRATES: Good point. Yes, that would be an answer to the classical solipsist's problem. The classical solipsist has no confidence that the appearances of a world of other people are not simply his own invention. You answer *that* problem by saying that the appearances of a world of other people are an *outside observer's* invention.
Hmmm... yet, somehow that seems like *relocating*, not solving, the problem of solipsism. I'm catching a hint of the same fatal flaw that brought Plato's theory down. Hmmmmmm.
Humberto, let me see... hmmm... how does the third party observer of the relationship between my wife and I know that he or she is observing anyone outside himself or herself?
Aha, that's it! Oh, Humberto, I hate to tell you this. Your ship has just gone down the solipsistic whirlpool of Charybdis, with all hands.

How does the third party observer know that he is observing anything outside himself? *He doesn't.* By your principles, only a fourth party observer could bring into existence the third party observer's environment and the organisms (my wife and I) that the third party observer is observing.

Ah yes, and then, unfortunately, a fifth party observer will be needed to bring forth the environment of the fourth party observer, so the fourth party can actually be observing the third party observing us. And then a sixth party will be needed to create the fifth party's observations. And on it goes.

Hmmm... yes. That's what we classical philosophers call an "infinite regress." When a theoretical system requires an infinite regress, Humberto, that shows it's a false theory. Some very fine theories, indeed, have collapsed when someone found that they required an infinite regress somewhere to support them.

Even great Plato's theory never recovered after Aristotle saw that it required an infinite regress. Aristotle called it the "Third Man Problem." The same name would work for yours. You are in good company, my friend. Some of the best minds in history have mistakenly tried to lay the foundations of their systems on the quicksand of infinite regress.

Socrates takes Maturana by the shoulder and they walk down the path in a long silence. Finally Socrates picks up the conversation on another note.

SOCRATES: We actually know quite a bit about nervous systems and the neurophysioloqy of perception here in the Elysian Fields these days. Both J.J. Gibson and David Marr have turned up down here recently. I like their work very much. They are quite confident, as I am sure you know, that there is a rich and accurate flow of visual information from the independent environment to the nervous system. They would find your difficulties with visual perception exaggerated and your denial of the existence of an independent world quite bizarre—and not supported by any particular scientific evidence.

On top of that, Gibson is in complete sympathy with your rejection of "internal representations" of the external world. His "ecological" approach to visual perception is thoroughly realist, but does not require the "representations" you claim a realist theory must.

Come, Humberto, cheer up. You will gain by taking a new approach. Other cognitive scientists have switched their epistemologies in mid-career. It is not the end of the world, nor even the end of a career.

And if you change your approach, you may free yourself from that list of extraordinary claims which your starting hypothesis, the closed nervous system, has forced upon you: (a) that the nervous system and the operations of the organism operate in *non-intersecting* domains, (b) that the organism's environment depends on an outside observer for its existence, (c) that languaging causes objects and the world to exist, (d) that cognition has no content and is not "about" anything, (e) that language does not exist in the nervous system but only out in the air between organisms.

Your theory is beginning to look like our old Ptolemaic geocentric theory of astronomy, which through time required an increasingly bizarre conceptual patchwork to explain, geocentrically, what later scientists discovered was a heliocentric solar system.

Perhaps your difficulty could be cleared up if you admitted that the nervous system is *open* to some information from the outside. It might have the kind of simplifying effect that shifting to the heliocentric theory did.

You've given these starting principles a run for their money. In fact, I can't imagine any of us doing much better, if we had had to start with the principles you started with.

It was a Promethean conceptual task you set yourself.

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Their walk has brought them close to a small village. A French-style cafe with several outdoor tables stands at the edge of the road. A smallish man with a cocked eye rises to greet them as they approach. He introduces himself to Maturana as Jean-Paul Sartre. Socrates greets Sartre, but then his attention is caught by others at the tables, and he leaves Sartre and Maturana to talk.

SARTRE: I have been reading your works, Professor. You are a brilliant and original man. You have attempted a philosophic tack that has elements which are quite new. I, too, tried to break new ground, but I found, later in life, that the roots of my thinking came from an unexpected place. I think you have realized that yours may come from the same place mine did. You know where we get these ideas, don't you, Professor. We get them from our childhood experiences of the world. Did you ever read any of my writings? Did you read *Les Mots, The Words?*

MATURANA: Yes, I did read one of your plays. I read *No Exit.* But I didn't read *The Words.*

SARTRE: Well, as you may know, the central thesis of my philosophy is that human individuals create themselves. We are radically free beings. We hate being free because of the tremendous responsibility of it, so most people pretend they are determined, that there are no alternatives. But that's another story.

It seemed to me that I had always known that I was self-created, that I had, in any sense that mattered, created myself. But then one day I examined my childhood to see when I first came to know this. You know when it was? Listen to this. My mother was the daughter of one of the Schweitzer men, a close relative of Albert. He was tall, white-haired, a very imposing figure. My mother had married a short man, a sailor named Sartre, who died before I was born. My mother moved back into her father's house at that time, and we all grew up there (see, that was a psychological slip of the tongue—/ grew up there). My mother was treated as a child in the family by her patriarchal father. And, of course, I was treated as a child. So, when I was old enough to start thinking about my place in the family, it was obvious to me that my mother was my sister. In addition, I was told that I had no father. Therefore I concluded, as a very young child, that *I had created myself.*

Now, you have spoken more than once of how your childhood experiences have influenced your philosophical stance. How you had very poor eyesight... you could see only vague images. You tell the joke of how your brother would have to distinguish for you in language the difference between a mailbox and a heavyset lady waiting for a bus.

Your experience makes the same kind of sense as my experience. You come up with a theory that objects only exist when they are "distinguished in language." You have also explained that all your life you have never wanted to be obedient. And I notice, in reading one of the places where you write about possible evidence for an independently existing world, the words "outside authority" (11) and "demands obedience" (12) come into your language. As you have explained to us, these attitudes have influenced your theory in certain ways.

That's fine, *mon vieux*, that's the existential throb of life. I tell you it's a rare thing for a philosopher or a scientist to be honest. You and I have both admitted the non-intellectual sources of our thought. I know of few others.

Now, let's take a rural child with sharp eyesight, who before the age of 10 spent a great deal of time alone, by himself or

herself, exploring woodlands and streams and lake shores, observing insects and the stages of plant life, stalking wild animals and listening to the subtle changes of bird calls—to such a person, your theory might sound absurd. Languaging, for him or her, precisely *inhibits* good observation. When someone else is present, the natural world is perceived less vividly and richly.

MATURANA: Monsieur Sartre, that's an interesting tale about your childhood. And you have accurately understood my description of mine. But there is other evidence that language is essential even to our becoming human. We do not arise as human observers unless we are participating in language. You have seen my references to the wolf girls, how they were not human observers because they grew up with wolves outside of language.

SARTRE: Yes, we've all studied the feral children data. Unfortunately, while suggestive, the data are extremely sketchy. We cannot repeat the experiments ethically, and it is impossible to say what has happened to these children with any accuracy. We do not know at what age they entered the forest, how much permanently scarring psychological trauma they suffered before they were lost or abandoned. Their bodies were covered with scars, as I'm certain you recall, from being bitten by the wolf cubs. It could be that they became autistic. That happens to quite a number of children in human homes, too.

As they talk, they drift closer to the cafe, until they gradually are within earshot of the nearest tables.

SARTRE: You've got guts, Maturana. I like that about you. But your world of mechanistic structure-determinism looks like a sell-out to some abstract requirement of biological theory. Then you say: "Human responsibility in the multiversa is total." (13) Now, that's my line. When humans are free, when it is clear that by our free choices we determine the significant things that happen in our lives, *then* "human responsibility is total." If we are all structure-determined at all times, my friend, no one can be held responsible for anything. You've changed the meanings of the words.

At one of the tables, Jonathan Swift and George Orwell are sitting, drinking coffee.

ORWELL: Did I hear him say "changed the meanings of the words"?

SWIFT: Yes, Orwell, Professor Maturana succumbs to that temptation, I'm afraid. He tries for a short cut.
   For his ontology of observing to be credible to us, he must get us to speak differently. He has to take many of the fundamental words of the language and change their meanings, twist them around. This way (if we let him get away with it), as we continue to speak the kinds of sentences that generations of our ancestors, through thousands of years, have shaped to describe the human praxis of living, the sentences will no longer mean what was originally intended. They will gradually carry the aroma, the pheromone, of his theory of an observer-generated world.
   In old Greece and modern Europe, a theory like his was called a Procrustean Bed. When the world we experience and articulate in the praxis of living is too rich for a theoretician's pet theory, he sometimes puts the language that the people speak on the rack and stretches it, or twists it, or chops it off, until it fits his theory. It's less bloody than putting the people's experience on the rack, in jails, but it can have the same controlling effect, in the long run.

But I guess you know something about that, don't you, George. In *1984*, you described Big Brother's changing of the language into "Newspeak." In that new official language, it was no longer possible to think clearly, key distinctions were blurred. "War is peace" was an important phrase in Newspeak, as I recall. "Hate is love" was another, wasn't it?
   I wrote something to the same point, once, only at the level of theoretical explanation. It was a section of *Gulliver's Travels*, the story about the intellectuals who lived on a flying island above the ground. Do you remember? It was Berkeley who stimulated that story, as much as anybody. On the island of Laputa, the intellectuals forever tried to fit the world into the Procrustean Bed of their own theories.
   The Procrustean Bed of Maturana and Varela is just as small in time and space as Bishop Berkeley's was. But now, at the end of the 20th century, after the discoveries of modern geology, paleontology, and astronomy, it requires a horrendous shrinking job to get the universe down into that bed. Imagine reducing the billions of galaxies, millions of light years apart (just the heat of them alone!), as well as 15 to 20 billion years of evolution, down into thimble-sized acts of distinctions of human observers in language, *with no residue!* These guys are circus performers like the world has never seen.

A man leans over to Swift from another table.

BARNUM: Did you say "circus performers"?

SWIFT: Well, P.T. Barnum! Come over and sit with us.

Barnum joins Swift and Orwell.

BARNUM: Circus performers, are they? Are they lion tamers, are they clowns, can they do flips on the high trapeze? What kind of performers? I'm always looking for good talent, even down here.

SWIFT: I was referring to clowns, the ones who cram 23 adults into a VW Bug, and then drive it away.

BARNUM: Well, you know, it's not hard. When people are hungry for a new theory, all you have to do is assure them that the one you've got avoids the exact problem that bothered them most in the theory they are just coming from. Do this for them, and they'll buy your whole ball of wax without examining it. It also helps to phrase your theory in a complicated self-referential jargon. It takes the reader a *loi* longer to catch on to any serious flaws. I tell you, the flaws can be as big as barn doors, in fact, the bigger the better. The people who come to the human circus are always looking for flaws in the details of what you present, but they will swallow your whole frame of reference uncritically.
   You learn a lot, running a travelling circus. In my time, I probably knew the American Mind better than any academic philosopher in the country. I knew the desire system and the credence system of the average American, and I could play it like a violin. I got famous on it. These guys will, too. They seem to know the formula already.
   Do you remember where they talk about how a part of their theory makes you dizzy, like an Escher drawing? That's the giveaway. Don't trust it for a minute. I made millions by getting people dizzy so their critical intelligence would lose its grip for a minute. It only takes a minute. Once you know how to do it with one pea and three walnut shells, you can apply the principle anywhere.
   But I warn you: these thinkers are very bright. It will take somebody sharper than an academic to uncover the essential flaw. If you want to do that, you'd better get Sherlock Holmes.

Well, I'm on my way. I heard that a young bareback rider from a European circus has turned up down here, and I want to make her acquaintance.

Barnum gets up and takes his leave. Swift and Orwell hear voices from inside the cafe. Orwell cocks his ear.

ORWELL: Doesn't that sound like Conan Doyle in there now, retelling one of those Baker Street stories? Let's go see.

Sure enough, leaning on the bar, wearing his double-peaked woolen hat and sporting his drooped Meerschaum pipe, is Dr. A. Conan Doyle. Swift calls out to him.

SWIFT: Dr. Doyle, our chum, P.T. Barnum, has given us an idea. We are hoping that your alter ego, Sherlock, could tease this one out for us. Would you be willing to try? It will require that you have read the book *The Tree of Knowledge* and perhaps some other works of Professor Humberto Maturana. He is a biologist who teaches at the medical school in Santiago, Chile. Ah, that means that you are fellow professionals. Good. Your medical background may be needed here. Would you be willing to give it a try?

My question is this. Like my countryman, George Berkeley, Professor Maturana claims that the universe does not exist, only human-based perceptions of a universe exist. Most thinkers have accepted that Berkeley's position is technically irrefutable, even though unbelievable.

Could you, do you think, examine this new neuro-idealist ontology and find the fatal flaw of argument that would constitute its refutation?

DOYLE: As it happens, Swift, I have read *The Tree of Knowledge.* And if you will be so kind as to lend me a couple of the other, more technical, papers of this gentleman, Maturana, and allow me an hour's time, I will return and satisfy your request.

Swift reaches into his portfolio and hands Doyle some papers.

SWIFT: By the way, Barnum hinted that there is a due. Look to the place where they say their argument will make you dizzy.

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The hour passes slowly as the conversation around the bar heightens expectations. Individuals look at the clock every 5 to 10 minutes. After half an hour, a couple of small bets have been laid. By 10 minutes to the hour, large bets are being placed on the table. The bartender is keeping the records.
As the clock strikes the hour, Sherlock Holmes steps in through the back door. In the subsequent hush, he begins to read:

The Case of the Missing Universe

1. The unasked question at the heart of the Maturanan theory is: in a world of operationally closed nervous systems, how is language possible?

2. As adults we have no memory of a time when we were not in language, but we observe children who begin their operations in the world without language, and we observe them learning language. We know that language begins at a time subsequent to the beginning of perception.

3. In the terminology of Maturana's theory, the relationship of the nervous system to language must be one of two sorts: either (a) some kinds of structural changes in the nervous system as the result of perturbations are required for the development of language between organisms, or (b) changes in the nervous system are simply not relevant to the particular actions of organisms which constitute language.

4. For many readers it will not be quite clear from the texts whether or not the "non-intersecting phenomenal domains" of (i) the nervous system and (ii) the actions of the organism are *effectively* linked by their "orthogonally related structures" in the process of languaging. Therefore, I will consider both possibilities.

5. If (a) is claimed, then Maturana must show how recurrent reciprocal perturbations of two closed nervous systems can give rise to coordinations of actions in their respective organisms, and beyond that to "consensual" coordinations of actions, and beyond that to "recursively" consensual coordinations of actions.

6. It is clear that purely random perturbations, with no pattern or order to them, could never give rise to coordinations of actions. If the perturbations show no pattern, no order or rhythm to which the nervous system can respond *as* a pattern, an order, or a rhythm of perturbation, then there is nothing (no pattern) to coordinate with.

7. From the point of view of a closed nervous system, the order of whose operations is structurally determined entirely from within, *all* perturbations are *random.*

8. If the nervous system could respond to the order or pattern or rhythm of perturbations which (an observer knows) come from the outside, then the nervous system would be what we call an "open system." Patterned or ordered or rhythmical perturbations received *as ordered* are what is traditionally meant by the phrase "transmitted information."

9. By definition, in this theory, no information is transmitted (14), and the nervous system is operationally closed. Therefore, all perturbations of the nervous system are received as random.

10. It follows, then, that it does not matter how many such perturbations occur back and forth between two organisms, how "recurrent" reciprocal perturbations become. There is still no basis for coordination, because at no time is there an *order* common to the two nervous systems—or, for that matter, common to the actions of one organism and the nervous system of the other. There is no way that the system can become "familiar" with its environment through structural coupling. (15)

11. If, for coordinations of actions to occur between organisms, the participation of their nervous systems is required, then *no* coordinations, much less "consensual" coordinations, can occur. The nervous systems will remain forever unaffected by any *patterns* originating from gesture, sound, or action in another organism.

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12. On the other hand, if (b) is claimed, then it becomes a mystery where a phenomenon as complex as languaging could arise from. For example, how would the human organism, *independent of any changes going on in its nervous system,* be able to adjust and coordinate its actions even minimally with another organism? Could it see another

organism's gestures, could it hear its words, given that its nervous system is not participating in the seeing and hearing process?

13.. In option (b), numerous technical linguistic questions arise. To state just one, where would the memory of vocabulary words reside? Would the memory bank for, say, a 2000-word vocabulary of English or Spanish or Mandarin Chinese words be found *outside* in the space between organisms, where languaging is supposed to exist?

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14. When this theory is examined carefully, my friends, and thought through to its necessary conclusions, it is impossible to see how languaging could happen at all.

14. Without language, the theory collapses utterly, since the existence of both the unity observed and the observer himself or herself depends on their being distinguished in language.

15. The theory might be saved if the nervous system were conceived as open to some minimal information flow. However, it is precisely the attempt of this theory to explain the happening of living on the basis of closed nervous systems. To accept that languaging requires nervous systems to be open would be to admit failure.

Q.E.D.

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Meanwhile, by the shores of a small lake, Socrates and Maturana walk soberly.

SOCRATES: From my perspective (given my age, I take a rather long view of things) it is the task of your generation to save the habitats and the species of the natural world. You have to think of the young people and their children and grandchildren-even hundreds of generations after yourself.

Certainly that will be *their* point of view. Nothing else will be remembered of your generation in 1000 years or in 10,000. All future generations will judge you on only one thing: whether you preserved for them, or destroyed forever, the natural world on this planet, the species and ecosystems that evolved before you.

You know, Humberto, given enough time, the human race can learn. It's a zigzag process, but learning does occur. We will sort out the questions of perception eventually. Humans will even come to understand their place in the natural world eventually. It doesn't matter how long it takes, as long as the natural world is still there when they come to it. But the way it's going now, our species will destroy most of the other species by greed, ignorance, and overpopulation before we finally figure out how to relate to them.

Your generation is living largely in ignorance of its crucial historical task. Voices are needed to wake the people up. I know you understand.

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Concerning the Phrase "The Utility of Cybernetics"

By Kirk Corey (1031 Music Building, The University of Iowa, Iowa City, IA 52242). Copyright never ever.

(Author's note: I realize that this topic came up quite some time ago. I was going to send the following as part of a group of replies on the above-named subject. It took me this long to remember that a group could be of one...)

Knowing nothing whatsoever about cybernetics nor the question of its utility, I consider myself well-equipped to address the issue "the utility of cybernetics." I do know about those things which are called useful.

In the area called science, utility is generally defined by the amount of money invested by the military and other corporations. I label this notion "GUBBB": Greater Utility Brings Bigger Bucks, or, Greedy Utility Bombs Barbarian Blasphemers. I hope that this is not the sort of utility sought by cyberneticians; there is no need for another field of study (is cybernetics a field of study?) to seek answers to the question "how to make more money."

I do not mean to suggest that one simply conduct experiments without funding by profit-seeking organizations. Such a suggestion would be naive, not cybernetic. Poor Mr. Einstein had no intention of murdering the citizens of Japan with his little theory of relativity. During the course of his research, many people questioned whether any application, or usefulness, would ever be found for his work. Unfortunately, a use was found, I am told.

I turn now to the field of music. There are many students and teachers who tell me that music theory is, after all, useless-the real meaning of music is in the heart, the liver, the spleen. They just haven't noticed that the suppliers of piped-in sound find music theory to be quite useful. These unknowing students (who find music theory useless) will never arrange

those sounds heard in restaurants which make employees work faster than they can (and gladly!), the sounds which make customers order more food than they want. These students will never write the theme music for the CBS evening news—sounds which tell you that the reporters are as plain and honest as an old folk-song.

The first people to make theories of music are long dead, and therefore receive no remuneration for their efforts. Neither did Einstein receive a military pension. But "useful" these ideas certainly have become. The moral (?!?) here is not hard to deduce: no matter how useless a notion may be called, some idiot child will surely find a way to pervert the notion into more GUBBB.

If I were to use the word "useful," it would apply to those tools which might be used to meet human needs. The trouble is that such tools must be designed and constructed in such a way that they might only be used to meet needs, not to deny them.

The construction of such tools is a non-trivial matter and thus requires cybernetics. It requires design to be planned such that the question "But what if it falls into the wrong hands?" makes no sense. The desire is not only to meet needs, but to construct some way that needs can only be met, and not denied. According to GUBBB, such a notion is useless. That's why I entertain it.

Now I'll ask a question. Who is it that wants to know about "the utility of cybernetics": GUBBB, or me?

Interplay:
On the Need to Adapt Educational Method to Organismic Process

By Michael Luke Aitken (Box 172, Honaunau, HI 96726). Copyright 1989 by Michael Luke Aitken.

At the meeting of the Committee on Educational Policy, July 20, 1978, I remarked that current educational processes are a *"rip off,"* from the point of view of the student. The present note is to explain this view.

It is a matter of *obsolescence.* While much that universities teach today is new and up to date, the presupposition or premises of thought upon which all our teaching is based are ancient and, I assert, *obsolete.*

I refer to such notions as:

a. The Cartesian dualism separating "mind" and "matter."

b. The strange physicalism of the metaphors which we use to describe and explain mental phenomena—"power," "tension," "energy," "social forces," etc.

c. Our anti-aesthetic assumption, borrowed from the emphasis which Bacon, Locke, and Newton long ago gave to the physical sciences, viz. that all phenomena (including the mental) can and shall be studied and *evaluated* in quantitative terms.

The view of the world—the latent and partly *unconscious* epistemology—which such ideas together generate is out of date in three different ways:

a. Pragmatically, it is clear that these premises and their corollaries lead to greed, monstrous over-growth, war, tyranny, and pollution. In this sense, our premises are daily demonstrated false, and the students are half aware of this.

b. *Intellectually,* the premises are obsolete in that systems theory, cybernetics, holistic medicine, ecology, and gestalt psychology offer demonstrably better ways of understanding the world of biology and behaviour.

c. As a base for *religion,* such premises as I have mentioned became *clearly intolerable and therefore obsolete* about 100 years ago. In the aftermath of Darwinian evolution, this was stated rather clearly by such thinkers as Samuel Butler and Prince Krapotkin. But already in the eighteenth century, William Blake saw that the philosophy of Locke and Newton could only generate "dark Satanic mills."

> From a memorandum circulated to fellow Regents of the University of California by Gregory Bateson, August 1978. (Bateson, 1980)

To someone interested in educational reform, Bateson's diatribe may seem no more than a generic complaint, equivalent to many others. As this paper will indicate, there is a difference. It lies in the willingness of Bateson and others such as William T. Powers, who are busily remapping behavior onto cybernetic models, to construct reliable, predictive, scientific models to support their convictions.

It's difficult to argue with Bateson's premise. Presuppositions do have consequences; if our way of life is so generally unsatisfactory, it's likely that reasons can be found in the philosophical assumptions on which we build our culture. And it's the nature of our school system to both mirror and perpetuate the assumptions we presuppose.

Charles Silberman comments upon this same issue in his introduction to *Crisis in the Classroom:* "What educators must realize...is that how they teach and how they act may be more important than what they teach." (Silberman, 1970) In the light of this observation, it's useful to consider the presuppositions in the following quotation from the 1844 Newburyport (Massachusetts) School Committee Report: "Pupils need governing, and this, in the last analysis, always means coercing, compelling." (in Silberman, 1970)

It's obvious that schooling based on such a premise leads to divisive and adversarial relationships between teachers and students. And it's also obvious that, despite the best efforts of generations of reformers, most schools still subscribe to the notion that coercion is fundamental to effective education. Recently, John Goodlad's survey results in *A Place Called School* (1984) cite widespread agreement among teachers and students alike that student misbehavior is the most serious problem in schools today. Coupled with the assumption that coercion is necessary, this bit of information suggests a need for more, and more effective, methods of controlling student behavior. And behaviorists, good Cartesians all, are conducting investigations along these lines.

Another way of using the information, however, would be to indicate a need to examine the fit between schooling methods and childrens' emotional, physical, and intellectual development during their years in school. This type of investigation yields a very different sort of information. Here are some examples: "One of the fundamental ideas behind most of what we do in school is that children should and must spend many years memorizing a lot of dull facts before they can begin to do interesting things with them. This is a foolish way to go about things, and it doesn't work." (Holt, 1967) Goodlad refers to the "restless exuberance" of young teenagers. Coupled with Holt's comment, what could one expect *but* misbehavior? Jerome Brinier comments: "Much of what we do and say in school only makes children feel that they do not know things that, in fact, they knew perfectly well before we began to talk about them." (in Holt, 1967) Holt uses this quotation to dramatize his assertion that our schools' tendency to be obsessed with evaluation cripples the learning process. The consequences, as described by Silberman, lead us back to the issue of misbehavior, but from a different perspective: "...students are not likely to develop self-respect if they are unable to master the reading, verbal and computational skills that the schools are

trying to teach. Children must have a sense of competence if they are to have a sense of self-worth... It is... children's failure to learn that produces the behavior problems... not the behavior problems that produce the failure to learn." (Silberman, 1970) So there it is: the explicit connection between the schools' ineffectualness as educators for the explicit curriculum, and the results rippling through the implicit curriculum.

Unfortunately, information of this sort is unlikely to interest a researcher committed to the discovery of more effective methods of coercion. This lack of interest may not necessarily be hostile (though on this issue it often is). It's natural—the insensitivity that results when two people focus their attention in different directions. Consider this comment: "Young humans come to be viewed only as students, valued primarily for their academic aptitude and industry rather than as individual persons preoccupied with the physical, social, and personal needs unique to their circumstances and stage in life... What their students saw as primary concerns in their daily lives, teachers viewed as dissonance in conducting school and classroom business, but seemed not quite to connect with them as problems in the lives of their students." (Goodlad, 1984)

It is precisely this dissonance which must be harmonized to render the behaviorist task unnecessary. I suggest that, in general, discipline is a substitute for the full engagement with students necessary for effective teaching. It is a reliance on an outmoded and mechanistic view of the human mind. If, as Silberman postulates, the goal of schooling is to educate all persons to full humanity, I note that the goal remains unattainable so long as educational psychology remains so heavily influenced by the narrow definition of "full humanity" proposed by behaviorism. Denying the existence of any aspect of humanity not registering on specific instruments may be useful as a way to simplify methodology, but the price is too high if the resultant world view promotes insensitivity to student motivation under the banner of "teacher knows best."

Of course, for the most part, teacher does know best. But to *emphasize* that not only dampens students' enthusiasm, but also blunts the teachers' sensitivity to the interplay of ideas, the cross-connections, and the often indirect approaches that strengthen and deepen a pupil's grasp of the subject matter. As a consequence, opportunities for cooperative interaction are simply overlooked. Or, it they are noticed, they're viewed with suspicion as tempting pathways to mushy accommodation.

The behaviorist denial of the significance of internal motivation, or purpose, is the key obstacle to the development of the sensitivity to students' concerns that schools generally lack. This denial lends support to the notion of school as authority, molding students as necessary for the good of all. It also makes possible a blindness to the relation between the controlling approach and resultant patterns of misbehavior.

Intuitively, humanists have sensed the error in the behaviorist approach for some time. But teaching is as yet a weak profession. While advances in other fields come about primarily because of expansion in relevant knowledge and the acquisition of that knowledge, teaching is not firmly established on strong underpinnings of biological, sociological, and behavioral knowledge. (see, for example, Goodlad, 1984) As Bateson noted in his memo to other Regents, it's not that the "underpinnings" are unavailable. It's just that education is so much in the bosom of our culture that even hard scientific evidence running counter to the mainstream is likely to be uninfluential. So it's not surprising that the systems analysis work done by Norbert Wiener in the first half of this century and its elaboration and applications to human behavior developed by Gregory Bateson and William Powers (among others) are not yet being used to lay the necessary solid foundation which educational reform is presently lacking. Nevertheless, the present all-too-general ignorance of work proceeding at the foundations of the discipline of education must end if reformers hope to succeed.

Continuing to base their arguments on surveys and heartfelt convictions without the support of basic research dooms them to cultural marginalization.

The problem is that understanding and accepting the recursive feedback model requires a change in the way one thinks. The change is not mystical or mysterious; it's just hard to describe in the linear logical modes our culture customarily employs to discuss intellectual matters. It's like learning a language, or like computer programming, and it requires that level of commitment. A paper of this length can only hope to give the reader a glimpse of what I'm referring to. For those interested in knowing more, the references provide a relatively accessible and much more complete introduction to the subject.

What an organism does affects what it senses, and what it senses affects what it does. Put this way, the concept of feedback becomes obvious. A person moving a cursor on a computer monitor with a joystick to match the movements of another cursor moving according to a computer program observes a mismatch, moves to correct it, observes the result—possibly an overcorrection—corrects again, and so on. If the computer's cursor moves discretely or slowly enough or predictably enough, there will be moments when the cursors match, and the person makes no changes at all. A diagram of this behavior might be drawn as follows:
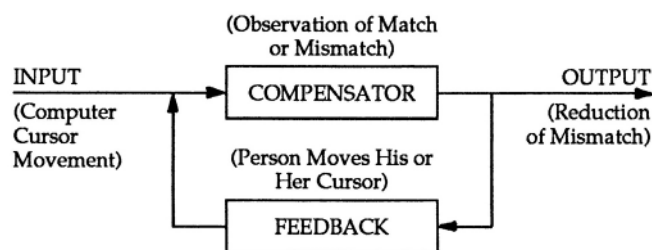
So far, this works as well as a behaviorist stimulus-response diagram as a cybernetic one. But if I whisper in the person's ear that he or she should hold his or her cursor one inch to the left of the computer cursor, the definition of mismatch changes. Now the times of the person's inactivity correspond to a different set of conditions on the screen. What this illustrates is that errors are always corrected with respect to a "reference condition." Note that even though the computer cursor may go through the exact same motions as before (the stimulus is the same), the person's response is different. What has changed is the reference condition maintained internally by the person. Whether this change is in response to some other event—a whisper—is irrelevant to the actions which take place relative to that reference condition. The reference is a perceptual condition—the perceived state of affairs (naturally, from the person's point of view, *not* the experimenter's)—that calls for no effort (Powers, 1973); another term that fits this definition is "goal."

Powers theorizes that behavior is oriented around the control of certain quantities with respect to specific reference conditions. The only reason a higher organism acts is to counteract the effects of disturbances on controlled quantities it senses. When the nature of these controlled quantities is known, together with the corresponding reference conditions, variability all but disappears from behavior.

What follows from this is that the stimulus is *not* generally what the organism is directly controlling. The organism acts to minimize the difference between the controlled quantity—which the stimulus disturbs—and the organism's reference condition. This minimization of the difference tends to obscure the facts that reference conditions exist, that matching external reality to those conditions is the organism's goal, and that, in this context, one can defensibly speak of the purpose or motivation of the organism to achieve that goal. "The

purpose of any behavior is to prevent controlled perceptions from changing away from the reference condition." (Powers, 1973) Put another way, an organism's direct control is not of its behavior, but of its perceptions.

From this necessarily brief discussion, it can be seen that an understanding of what a student considers significant—that is, the perceptions he or she is controlling, and his or her reference conditions—is critical to effectively educating him. With this background, the "general failure to view subjects and subject matter as turf on which to experience the struggles and satisfactions of personal development" (Goodlad, 1984) becomes inexcusable. And John Holt's contention (1967) that "to understand the learning problems of another person, particularly a young child, we must try to see things as if through their eyes" becomes tautological.

The behaviorist approach validates the perception of the experimenter at the expense of the perception of the subject. Insensitivity to the purposes of the subject is a basic tenet of the approach. Schooling based on this concept places all the validity in the teacher (and the administrator), and none in the student. It's bad enough that this way of defining a social relationship is so noxious to the person placed in the inferior role, as Holt points out so eloquently: "Most of the time, most of us do not like at all to be confronted with someone who knows a great deal more about something than we do... Even in the privacy of our own minds, we do not like to be made to feel ignorant and stupid. Confronted by what we do not know, we try to protect ourselves by saying that it is not worth knowing... we ought to remind ourselves now and then that sometimes a competence model can be altogether too competent. We must be careful not to rub children's noses in their own weaknesses." (Holt, 1967) What's even more significant is that it's not even an accurate description of what's actually happening. Gregory Bateson points out that a part of a system may not control that system, but only influence it. The feedback set up within the system by the actions of one part of it will modify the other parts, but only in the manner and to the degree permitted by those other parts' controlled perceptions and reference conditions. And their corrective actions, taken to minimize the error between controlled perceptions and reference conditions, in turn influence the rest of the system, setting up a recursive feedback loop, which oscillates around one or another stability pattern. Any attempt to arrogate that control role is a misapplication of linear logical patterns to recursive feedback systems, or what Bateson called an error in logical typing.

A governor, as the term is used in a feedback system, maintains the system in a desired steady state (at a reference condition) by generally minor modifications fed into the ongoing stream of events. It rules the system only in the Taoist sense of *the ruler as servant of the system. It* must be sensitive to, and even anticipate, the needs of the rest of the system, and adjust to accommodate those needs. It's precisely this role that must be occupied by the effective educator, whether teacher or principal—a role requiring sensitivity to the individual student's specific needs, as well as the mass of students' usual needs, in order to adjust the system the educator monitors (governs), and which the educator is part of, to meet those needs.

The proper role of the authority figure is not an issue that's unique to education. The same dialectic proceeds in many other fields of inquiry. In physics, for example, the gradual changing of the guard from the monolith of Newtonian science to the relativistic, non-deterministic universe postulated by Einstein and Heisenberg has been in process for the last 80 years. One key insight coming out of that shift is the discovery that the manner in which the scientist occupies the role of observer in the conduct of an experiment has a definite effect on the outcome of the experiment. In agriculture, Fukuoka's *One Straw Revolution* (1978) and Mollison's *Permaculture* books (1978, 1979) describe a relationship between farm and farmer which includes the farmer as part of the system, rather than being "in

charge" of it, using a form of Powers' feedback model.

In literary criticism, Jacques Derrida and the Deconstructionists have taken issue with the vested interests of Structuralism and the New Criticism by challenging their implicit assumption that literary criticism in general is distinct from the literature it criticizes, and thus offers access to a special kind of knowledge not otherwise available. Derrida argues that the act of writing common to both is much more significant than the artificial distinction literary critics attempt to make, and dismisses the role of authority they attempt to assume as a block to deeper understanding of a creative work. Just as students and teachers can function more effectively as colleagues, so may writers and critics come to find freer creative expression in a collegial relationship. (see, for example, Norris, 1982) Childbirth and childrearing have developed similar revolutionary schools. Writers such as Frederick LeBoyer and Jean Liedloff (1977) strive to reduce the power imbalance between physician and mother, centering the focus more clearly on the process of which they are both a part.

In psychotherapy, the development of a client-centered therapy, which exploded around the time of Carl Rogers' book by that name, is resulting in approaches like Eugene Gendlin's *Focusing.* Gendlin isolated the internal process which characterizes successful therapy patients, and has begun teaching people how to use this process to treat themselves. He writes: "If I were your personal therapist, I would resist the powerful temptation to tell you things, as though I knew more about your problems than you do. But I would not just let you talk either. I would teach you to focus effectively, and I would keep you company as you did so." (Gendlin, 1978) Note his ability to retain control of the process without the need to assert control over his client.

Similarly, Silberman (1970) argues that the legal system, the medical system, and the social worker system should change in ways that empower the clients they serve to shift the balance of power that steepens the grade of the present hierarchy. Included in his argument is the proposition that the professionals in those fields come to view themselves more as educators to achieve this end, which will tend to create a more interactive relationship than the present authoritarian setup permits. The burgeoning use of paramedics, paralegals, and outreach workers is a step in this direction, blurring the lines between professional and educated layperson. This is a trend in educational sociology that educators would be well served to apply to their role as educators. "Facilitator" becomes the operative word.

The question now becomes how specifically to apply these principles in education. Fortunately, good examples abound. The informal schooling movement in England, and its spinoffs in this country, are developing methods which avoid the students' defensive reactions to curricula they perceive as irrelevant and to teachers who are overly punitive and judgmental. Children work in small groups, with a variety of activities occurring simultaneously, and easy movement of students from one activity to another. There's also a relaxation of formal control by the teacher. (Silberman, 1970)

Kjell-Jon Rye's Technology class at Bellevue High School in Seattle adds to these qualities an up-to-the-minute relevance and hands-on approach to lesson materials that has generated an almost unbelievable degree of student interest and dedication to learning, as well as solid achievement. Behavior problems in Rye's class are almost non-existent. (Halprin, 1989) The film "Stand and Deliver" offers another example of a teacher who overcame behavior problems by generating student interest in his subject. A critical element in his approach was his students' perception that they were important to him not just as students, but also as people. Common to these and other successful attempts to create an environment for successful learning is the students' perception that their needs are being addressed. The teacher need not relinquish control of

the process of education in order to create that perception, as these successful demonstrations show. Chaos does not ensue from the dismantling of hierarchy; interaction does.

Of course, this type of interaction cannot be sustained in our present school environment. Teachers attempting to change things on their own burn out fairly consistently. They need the support of their schools, and the schools need the support of their communities, as well as their bureaucratic leaders. *Recursive feedback circuits need to be set up at all levels of the hierarchy.* As Goodlad (1984) notes: "Schools will improve slowly, if at all, if reforms are thrust upon them. Rather, the approach having the most promise, in my judgment, is one that will seek to cultivate the capacity of schools to deal with their own problems, to become largely self-renewing." In other words, the best place to educate an autonomous, self-directed student is in an autonomous, self-reliant school. There's some public support for this. Goodlad (1984) reports: "Most of the parents we surveyed would take power from the more remote, less visible, more impersonal authorities heading the system, and place it in the hands of the more visible, more personally known, close at hand staff of the school and parent groups dose to the school." And there is evidence of this in Hawaii right now, with current moves to decentralize the decision making in its school system. This kind of support is critical; there will be no meaningful, lasting change without it.

Ultimately, no one really wants an ineffective educational system. We've trapped ourselves in one by our natural conservatism—our desire to protect what we already have—on one hand, and our misunderstanding of the workings of human behavior on the other. Though effective educators and educational systems do exist, they explain their successes by appealing to intuitive descriptions of human behavior, rather than basing their programs on a clear and reliably predictive model of human behavior. This flawed approach isolates their successes, weakens their credibility, and serves to reinforce the convictions of those who look to coercion as the answer to student misbehavior. It is the responsibility of those who would effect humanistic changes in our educational system to acquaint themselves with the writings of those whose work is capable of supporting and guiding those changes. The major task of educational reformers remains one of education: of their colleagues, their fellow citizens, and their political leaders. This task is much more likely to be accomplished by educators who are at least conversant with a workable scientific rationale for their heartfelt convictions.

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Freedom or Control?

By Neill Kramer (74 Arvine Heights, Rochester, NY 14611). Copyright 1989 by Neill Kramer.

Am I free, or am I under the influence of control mechanisms? Is control a form of freedom, or is it an intolerable grid from which one cannot escape?

From a Batesonian perspective, the stream of cosmic and earthly events becomes punctuated by an observer who maintains consistency in his/her pattern of punctuation. To that extent, true freedom can never reach the observer, since the observer is at least partially locked into a particular pattern of punctuation.

This pattern, as I see it, is the control of the observer, and clusters of these patterns develop into more or less unconscious "rules of governance" for the observer. Good, bad, love, hate, can be seen as clusters of punctuation patterns, although new information can enter an already well developed pattern. To use a physical metaphor, a comet entering a solar system may upset the atmosphere of a particular planet, but not upset the solar system's placement within a galaxy.

What can we do about these clusters of punctuated patterns? Would psychoanalysis help? Could we ever free ourselves from these seemingly innate perceptual matrices? Or should we throw up our epistemological hands and say, "Don't worry, be happy"?

Further comments would be greatly appreciated.

Book Review

By Paul Ryan (924 West End Ave., Apt. 42, New York, NY 10025). Copyright 1989 by Paul Ryan.

Coming to Our Senses: Body and Spirit in the Hidden History of the West by Morris Berman (Simon and Schuster, New York, 1989) is a "must read" book for cyberneticians. Thinking cybernetically is often so exciting and compelling that there is a failure to appreciate the cultural context of cybernetics. Berman's well written book offers an interpretation of Western culture that deals explicitly with the brave new world of cybernetics.

Berman has his doctorate in the history of science from Johns Hopkins. He has written an impressive scholarly history of The Royal Institution of Great Britain (titled *Social Change and Scientific Organization),* and *The Reenchantment of the World,* which ends with an appreciative look at the work of Gregory Bateson in the context of modern science.

The first chapter of *Coming to Our Senses* deals with the sources of alienation from our bodies, drawing on the work of Henri Wallon, Merleau-Ponty, Jacques Lacan, and others. Then there is a fascinating chapter titled 'The Wild and the Tame: Humans and Animals from Lascaux to Walt Disney" about our relation to animals as an index of our relation to our bodies. The next five chapters extend this discussion by means of a typology of heresy. Berman argues that gnostic somatic practices are at the basis of the four major heresies in the West: Christianity, the Cathars, Science, and Nazism. Here he is at his best as a serious historian who knows how to find and use sources well. While the explanation of Christianity as heresy may be too densely packed to follow easily, Berman carefully charts the recurring cycle of somatic heresies becoming formal orthodoxies devoid of somatic intelligence.

Berman is looking for a way to get out of this cycle with our bodies intact. Hence his critique of cybernetics in the last section of the book. Based on his typology of heresy, he warns us about possible co-option of the new somatic holism by

cybernetics: "What I call 'cybernetic holism' is the tendency... of the scientific/corporate establishment to 'buy up' the holistic worldview and energy, repackage it, and then sell it back to the public in a 'legitimized,' 'sanitized' form."

The book has limitations. In attempting a somatic history, Berman uses a "five body" model that is weak. This model allows him to virtually ignore changes in our bodies due to changes in technology. There is no discussion of the work of Harold Innis on *Empire and Communication,* or of McLuhan's work on changes in sense ratios (hence our bodies) brought about by different technologies (1). How would Berman's somatic heresies map onto McLuhan's descriptions of how in the West "we shape our tools and then our tools shape us"? The discussion could be very fruitful around the actual use of the computer. Also, Berman's discussion of creativity and "ways out" at the end of the book doesn't really deliver any clear understanding of how to break the cycle he has identified. Moreover, his understanding of cybernetics doesn't include imagining a cybernetic culture that does not betray the body. I think such a culture is not impossible. These are questions raised for discussion by the book; Berman doesn't purport to have the answers. He certainly has some damn good questions for cyberneticians.

Note

1. For McLuhan's discussion of Electronic Man as "Disincarnate" Man, see "A Last Look at the Tube," *Antigonish Review* (74-75), 1988, 197-200. See also Phillip Marchand, *Marshall McLuhan,* Ticknor and Fields, New York, 1989, 238 ff.

Electronic Mailing List for Systems Science & Cybernetics

This mailing list is now in operation on the SUNY-Binghamton computer system. Its purposes include: (i) facilitating discussion among those working in or interested in the general fields of Systems and Cybernetics; (ii) providing a means of communicating to the general research community about the work done by Systems Scientists and Cyberneticians; (iii) housing a repository of electronic files concerning Systems and Cybernetics, for general distribution; and (iv) providing a central, public directory of Systems Scientists and Cyberneticians. The mailing list can store or transmit notes and messages, technical papers, references, calls for papers, computer programs, and pictures and diagrams.

The list is coordinated by members of the Systems Science Department of the Watson School at SUNY-Binghamton, and is affiliated with the International Society for the Systems Sciences (ISSS) and the American Society for Cybernetics (ASC). The list is open to everyone; currently there are about 200 members. To subscribe, you need a computer account with access to one of the international networks (BITNET, USENET, ARPANET, INTERNET, CSNET). Send a file containing only the line: 'SUB CYBSYS-L your_full_name' to the list server at the address LISTSERV@BINGVMB.BITNET.

After subscribing, post a message to the list itself at the address CYBSYS-L@BINGVMB.BITNET. In the message, include your name, affiliation, and a brief description of your work and/or interest in Systems and Cybernetics.

Note that a copy of the mail you send to the list will not be echoed back to you. To have a copy echoed, send the command 'SET CYBSYS-L REPRO' to the server.

List owner: Cliff Joslyn, 6 Garfield Ave., # 2, Binghamton, NY 13905 (vu0112@BINGVAXU.CC.BINGHAMTON.EDU).

American Society for Cybernetics Election Results

The following officers serve three-year terms: President, Fred Steier; Vice President, Rod Donaldson; Secretary, Sandy Blount; Treasurer, Andrea Maloney-Schara; Ombudsmen, Gary Boyd and Mark Sullivan.

The following Trustees were elected to six-year terms: Jeanne Bamberger, Lynn Hoffman, Humberto Maturana, and Terry Winograd. They join Stafford Beer, Roger Conant, Heinz von Foerster, and Ernst von Glasersfeld, who are serving the remaining three years of their six-year terms.

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Continuing the Conversation

A Newsletter of Ideas in Cybernetics

Co-Menting: Toward a Systemic Poietology?

By Klaus G. Deissler (Institut für Systemische Therapiestudien, Friedrich-Naumann-Str. 9, 3550 Marburg, GERMAN FEDERAL REPUBLIC). Copyright 1989 by Klaus G. Deissler.

(Author's note: An earlier version of this paper was presented in Bremen at a conference of the same name, November 4-5, 1988, at which Tom Andersen and Harry Goolishian were the main speakers. The present paper was presented at the First World Family Therapy Congress in Dublin, June 19-22, 1989. The title was borrowed from a contemporary Irish singer: "Poetic Champions Compose.")

Summary

In this paper I will present the essence of my own ideas about systemic therapy. It is the result of about 15 years of systemic therapy practice—seeing at least 10 client systems a week.

The ideas and models I propose here thus result from mutual influences between practice, theoretical reflections, and searching for better understanding therapeutic processes. In the context of my conclusion that any school of psychotherapeutic practice may be viewed as a school of the art of constructing interpersonal realities—mainly in conversation—I propose constructing *systemic therapy as poetry in and through conversation.*

To illustrate this point of view ideas and formal models are proposed to understand therapeutic conversations as co-mental processes.

> Whereof one cannot speak, thereof one must be silent.
>
> Ludwig Wittgenstein

> Any conversation presupposes a common language, or better: it forms a common language...
> Being understood in conversation is not merely a matter of exposition and getting ones own point across, but rather a process of change toward a shared view in which one no longer remains what one was.
>
> Hans-Georg Gadamer

Preliminary Remarks

In starting on a new chapter of a book, one has usually already read a few pages of the book. I assume that the readers of this journal have an idea of what systemic (family) (1) therapy is. I further assume that they read CC because, among other things, they are looking for new directions and new viewpoints, i.e., because they want to begin new chapters.

In that case, I think it important not to devalue previous experience, but to view it rather as a valuable basis for developing new ideas and methods. On the other hand, what is being held up here as "new" should not later appear to be "old wine in new skins," only the packaging being new.

In order to find a common basis on which to build, I suggest that the reader at first assume that I am simply using new terms for familiar ideas, other words for familiar notions. He or she may then decide later how "new" the proposed views are to him or her. Let me begin with two limericks quoted by Bateson in his last book, *Angel's Fear:*

> There was a young man who said, "Damn.
> I begin to perceive that I am
>   A creature that moves
>   In determinate grooves.
> I'm not even a bus, I'm a tram."

And the reply:

> There was an old man who said, "Cuss.
> I must choose between better and wuss.
>   By rulings of Fate,
>   I must keep myself straight.
> I'm not even a tram; I'm a bus."

Why have I chosen these limericks?

They are concerned with the degree of freedom we have in making decisions, the limits of this freedom, and with knowledge of these circumstances as related to differences of age. The model chosen, tram or bus, determines the degree of freedom.

Delimitation of the Discussion

Such topics as the degree of freedom attainable by changing our outlook on epistemic processes have been current for some time in the discussion of therapeutic views and practices and efforts to understand them. It may still seem surprising, however, that we are plagued with complicated questions and concerned with the ideas of Bateson, Maturana, von Foerster, etc. on the question *"how do we know what we know?"* Such questions belong to epistemology; we are concerned with questions pertaining to the description and explanation of the processes of acquiring knowledge.

And why do these concern us? One answer may be that many psychotherapists believe that the problems they have in their own profession and which they acquire through their patients will be solved by considering the question "how do we know what we know?" That question concerns *the way in which we acquire knowledge,* and an answer would seem helpful in solving our own problems.

In these endeavors, we increasingly encounter constructivist ideas such as those proposed by Ernst von Glasersfeld (1987). We no longer postulate the ability to recognize an "objective" reality; rather we develop models more or less fitting to our experience. We construct "experience-models." When we become aware that our model no longer fits, we must either change it or develop a new one. As in the familiar example, we may picture the earth as flat if we only want to lay out a

football field. But this model no longer fits or is viable, in Ernst von Glaserfeld's terms, if we want to put a satellite into orbit. Thus we require models which are conducive to answering the questions we ask.

The question I have asked myself, and which many of my colleagues share, is "what are the fitting models for psychotherapeutic processes?" i.e., *how do we construct what we construct?*

The first point that became clear to me after asking this question is the following. The basic question of epistemology, namely "how do we know what we know?" differs somewhat from the question "how do we construct what we construct?" The former entangles us in an absurdity. For we consider the constructivist ideas to be the product of epistemic processes. That is, we say that *the way we construct models* fitting to our questions depends on the *way we know what we know,* i.e., on epistemic processes. We thus say that our *constructions* of reality depend upon the processes of gaining *knowledge* of reality, and therefore that our constructions depend on how we gain knowledge of that which we call (objective) reality. In other words, *our constructions depend on the process of acquiring knowledge.*

I do not want to say that this is false, but only that this way of looking at things, this model, does not appear to me fitting. Acquiring knowledge (epistemic processes) has connotations of perceiving (objective) states of affairs, whereas "construction" is seen more as a subjective process.

For that reason, I propose that we psychotherapists begin a new chapter in our way of thinking and give new meanings to these questions by means of a new general notion. I propose that we no longer speak of epistemology when we are concerned with constructions, but rather of *Poietology.* (2) Accordingly, the question "how do we know what we know?" should then no longer be central, but rather the question *"how do we construct what we construct?"* or *"how do we invent what we invent?"*

This approach has, I believe, the advantage that we as therapists achieve a new degree of freedom in the construction of the therapeutic context. We are no longer tied to the apodictic limits of our faculties of perception and so no longer need to reject "crazy" viewpoints as incompatible with the epistemic processes of perception, terming our patients "ill" and devaluing them.

We are thus led to such questions as the following.

a) What methods of construction are most fitting to cooperation with the clients? *(Pragmatic Criterion)*

b) What methods are most pleasant for us and the clients? *(Aesthetic Criterion)*

c) What methods are most responsible? *(Ethical or Ecological Criterion)*

d) What methods are financially viable? *(Economic Criterion)*

All things considered, I think that this approach—asking *how we construct what we* construct—best fits our position as therapists. It can be summed up in the question: How can we facilitate the construction models of reality with our clients which put us in a position to:

a) cooperate with our clients in such a way that they may construct an escape from their dilemma or difficulties, and

b) better construct the processes of this cooperation so that we can better understand them?

If we accept this attitude, we approach what might be termed "poetology," i.e., the art of poetry as first set out by Aristotle. The difference between ourselves and the poets who write to stimulate our imagination would seem to be that we must negotiate the degree of freedom we have with the client seeking counsel. We cannot simply ignore the realities constructed by the client, but must accept, respect and understand them as the first prerequisite of therapeutic activity. *The clients' stories*

are the matrix to which we relate our own therapeutic stories, and against the background of which we must co-construct them.

The most important, necessary components of this therapeutic position are curiosity (Checcin, 1988) and not-knowing (Goolishian, 1989) with respect to clients' stories; to these may be added the cooperative, conversational, and/or narrative inventiveness of the therapist as a sufficient prerequisite. We must weave our stories or constructions with those of the clients in such a way that new patterns, effects, and meanings can result. Therapeutic inventiveness, however, is only as effective as we are curious about the stories constructed by the patients themselves. It therefore seems inappropriate to think that one understands before the clients themselves grant that understanding or feel understood. *Therapeutic inventions* (stories) only "take" constructively to the degree that they suit the stories and accounts (constructions) of our clients. Only then can our stories be meaningful for the clients, and only then can a new, mutual story emerge from the co-construction of clients and therapist.

Therapy: A Conversational Reality?

It becomes clear that our main therapeutic tool is language. To put it briefly, with this instrument we generate realities or, as Maturana says, *multiversa.* If we consider the therapeutic setting and ask for the common factor of the various schools of psychotherapy, the various therapists, and their many important differences, we quickly come to the answer that it is conversation. *In conversation with our clients we generate meanings and patterns of relationships or deal with the constructed effects of our actions.* We speak with our clients, engaging in conversation; therapeutic interaction, the greatest part of what we do, occurs in and by means of language.

Accordingly, an understanding of language is called for which recognizes its essential contribution to the generation of reality, e.g. through connotations, generation and alteration of meaning (attribution and revocation of meanings). But not only this; we must consider more than just the *generative semantic aspect.* We must also consider the *generative syntax* (generation of rules and patterns of relationships) as well as a *generative pragmatics.* This means that together with our clients we generate meaning, constructing certain relations (patterns) and inventing certain effects in conversation.

Since we want to view language as one of the most important tools for constructing reality, it will be worthwhile to reflect on the possibilities and limitations of this generative instrument.

As various authors have pointed out in this context, we use language to make *distinctions.* We draw attention to some portion of an otherwise undefined something, some chaos or flux of a non-determinate "soup"—call it Tao, if you wish. If I say, for example, "do you see that dog?" and I point with my hand, most every competent, native speaker of the language will be able to see just what I mean. Of course, things are not quite this simple. The important point is that we make distinctions when we draw attention to "things" around us the "existence" of which is assumed. We make distinctions between what we mean and what we do not mean. We call things forth by their meanings, etc. This understanding of language is not new; we already find it in the distinction between figure and background, text and context, etc. It makes some difference, however, whether we assume that we simply give names to "objectively" present things—the *denotative view of language*—or that we use language to call them forth, create them, invent them, etc., in various contexts of meaning.

The view being put forth here is that language has a *connotative function.* We assume that meanings are attached to certain things simultaneously *brought forth by us in and through language.* Thus the familiar example of the pessimist who calls the glass half empty and the optimist who calls it half full il-

lustrates a difference in meaning attribution. While an observer sympathetic to the objective construction of the world might say that both see the same thing, the present view permits saying that they do not, but rather that they generate different meaning-contexts. According to this view, we therefore use language to generate meanings and meaning-contexts. Communication becomes a reciprocal process of generating and proposing meanings in various contexts.

Bateson, of course, spoke of "the difference that makes a difference." Similarly, we may say that the distinctions proposed in conversation trigger further distinctions by the partner in conversation, who in turn initiates still further distinctions, etc. (cf. Deissler, 1986).

One of the most important aspects of conversation is that we can refer to things not (physically) present. If, for example, one meets a colleague at a flea-market and discusses a third colleague who is not present and the latest good or bad news from him, then persons, relationships, places and times "not present" are being spoken of. We can illustrate this with the classic solution-oriented question, *"what will you do first when your problem is solved?"* This question suggests imagining a solution at some indefinite point in time and then doing something after the solution has been achieved. We cannot point to these constructions; they are developed in language. Some linguists see in this the *possibility of situation-free, linguistic communication,* permitting us to speak of things which are *not, or not yet, present.* Other examples include talking about the future, the past, absent persons, hypothetical processes, telling stories, etc.

The situation is similar in therapeutic conversation. We usually discuss contexts which are "not (immediately) present," to which we cannot point. *We thus produce in conversation the contexts* which are the objects of the conversation, even though these are not present. The remarkable aspect of this is that it works. We can make ourselves understood and can generate therapeutic solutions or, as Goolishian et al. would say, form problem-dissolving linguistic systems (Goolishian, 1989). In and through conversation, we can invent realities that improve our lives beyond the context of the immediate therapeutic conversation. We call forth and grasp realities which, literally, cannot be grasped.

Thus it can be said that therapeutic conversations generate realities which would classically be assigned to the imagination, i.e. which are not—or not yet—present. The therapeutic conversation can thus be seen as *poetry in and through conversation (dialogue).* In it, new constructive realities are invented. In Goolishian's terms, *therapist and client are co-authors of a (new) story.*

But if this is so, and this kind of generation of reality is helpful, then we may ask why better advantage is not taken of this aspect of our lives by constructing *"future (positive) realities"* in therapeutic conversation (cf. Penn, 1985; Tomm, 1988; Lipchik DeShazer, 1986).

As therapists, we are all familiar with patients distinguishing between talking and acting. Thus a client may say at the end of the session, "we have *talked* about all the problems, now what should we do about our son?" Or we may find certain clients quite sensible and eloquent in the therapeutic conversation, although their behavior changes little in the direction they would like and can well express. Others may be untalkative and even clumsy with words and yet report satisfactory changes.

Most therapists explain this phenomenon to themselves by means of the so-called incongruity between analogue and digital communication, i.e., a deviation of speech from action. The implicit assumption in this is that the two are different and must be distinguished.

Many therapists see another difficulty in linguistic processes. They claim that language is *linear* and thus only adequate to sequential processes, e.g., *before-after, if-then.*

In difference to this view, still others complain that in language one is forced to make statements about statements and that *self-reference* then becomes a problem. In my opinion both of these views are too narrow and there are indeed possibilities for making constructive use of such linguistic constructs.

Thus Maturana and Varela (1987) resolve the above distinction between action and speech into the more general notion of *coordination.* Put simply, they present the following construction. There are simple kinds of coordination of actions occurring at a non-linguistic level, as when two people walking toward each other coordinate their actions so as not to collide. But when they begin to speak about these actions, they find themselves at a higher level of coordination, namely in language. *They coordinate (linguistically) on their coordination (of actions).* (They thus employ language to describe a linguistic phenomenon, taking advantage of the self-reference rather than banning it.)

In this way, we can view the *therapeutic conversation* as one in which an *improved coordination of actions is negotiated linguistically.* For example, a bed-wetting child can coordinate with his mother in the therapeutic conversation so that their actions become coordinated in such a way that the symptom disappears. Thus realities are negotiated in the therapeutic conversation which only become effective in another person-space-time context. We can make a distinction, then, between being in language and other kinds of action, by distinguishing between simple coordination of actions and coordination of that coordination as occurs in language.

Bateson and Korzybski asserted that "the map is not the territory." To my knowledge, only after Bateson's death, unfortunately, did Heinz von Foerster proclaim that "the map *is* the territory." Bateson makes a distinction between map and territory; with a linguistic operation, he generates a difference between the two. Von Foerster wants to dissolve the linguistically generated distinction with a new linguistic operation.

It would certainly have been interesting to hear the two dispute the point, and particularly so against the background we have been developing here. We can only ask Heinz von Foerster what he intended and how his thesis can be reconciled with the distinction between speech and actions. Might one not say that the map is speech and the territory is action, that there are various degrees of agreement between them, and that the goal is to reunite them? ... that both theses are right?

Be that as it may, let us make use of the controversy by considering the question "how can linguistically generated distinctions be reconciled?" i.e., "how might one meet von Foerster's demand?"

Von Foerster attempts to reconcile a linguistically generated distinction by means of an identification: the map is the territory; the idea is the object. From a constructivist point of view, it is less a matter of which of these two theses is "right" or "true" than of how well the distinction fits with our concerns.

Is, for example, this distinction helpful in therapeutic conversations? Should proposed solutions (maps) be distinguished from their implementation (territory), as is done in classical approaches to therapy?

Or is it more appropriate to say, *"in the therapeutic conversation itself, solutions of constructive realities are generated" ("the conversation itself is a solution" = "the solution is to continue the conversation")?* I do not want to make an either-or decision here in favor of one or the other standpoint. I believe that both views can be helpful, above all when used in conjunction. Each thesis is linguistically generated and so represents a construction. In my opinion, they belong together and offer possibilities for solutions through their very incompatibility. We may ask ourselves, "are they both more or less applicable; do they exclude one another; are they, perhaps, even complementary; are both to be rejected?"

all or nothing,
both... and...
or
neither nor?

I personally believe that it is less important what we as therapists think, or how our clients view their realities, than how these two possibilities are related to each other. Do the clients make a distinction? If so, the map-territory metaphor is likely to be useful; if not, it may be better to dispense with the distinction.

Varela (1979) also noticed this problem in another context, and he suggested that when two distinctions appear contrary they may best be seen as generating one another, i.e., as complementary components of a single unity. A few examples of such pairs are: figure/background, system/individual, text/ context, and stage/play, territory/map, observer/observed.

Keeney (1983), too, proposed the construction of complementary unities with his *recursive unities.* One could even say that, basically, the point of von Foerster's "the map is the territory" thesis is to dissolve the linguistically conceived separation by means of a recursion. Taking the individual as the starting point and *observing the observer,* as it were, it becomes clear that eventually the circle must close and the observer becomes the observer of himself.

A further example of the situation just mentioned is the linguistic distinction between self-change and self-confirmation. This linguistic distinction can be reconciled into a recursive unity. The example will be considered further in the next section.

Tools, Toys—Tolstois?

All things considered, one might well ask what further utility the consideration of cybernetic models could have in better understanding the therapeutic conversation. I will begin by cautioning the reader against taking the following models too seriously; they are models, almost toys, to help in generating realities. Only by playing with these tool-toys can it become clear whether they are fitting, useful, or superfluous. I invite the reader to join me in an attempt to apply these tool-toys to constructing therapeutic realities.

We begin by supposing an autonomous system, an individual or composite system, to have two tendencies:
a) A tendency toward change
b) A tendency toward stability.
Relating these tendencies to each other gives a recursive unity. I will use the notation suggested by Keeney (1983) and others:

(e.g. client or therapist)

This recursive unity can be semantically altered somewhat to give the following recursive unity:
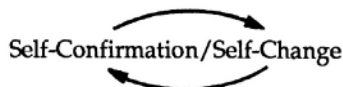
(e.g. client or therapist)

We can assume that a therapeutic system consists of at least two such autonomous systems in interaction: client and therapist. Let us now suppose that neither of the two unilaterally determines the relationship; neither can force the other into something. One of the partners in communication, however, says:

I find that my own autonomy is restricted and so propose that you view me as a client, and further that you act as a therapist and conduct conversations with me to permit me to regain my autonomy.

The other of the two accepts the proposal, for he has long been active as a professional therapist, sees himself as such, and can accept the client's proposal to be viewed as a client.

To keep the example from becoming unnecessarily complicated, we assume that a therapeutic system has been established. On each side is an autonomous system, but there is a small yet important semantic difference between the two: one of them is recognized by both as client (Cl), the other as therapist (Th). (3)
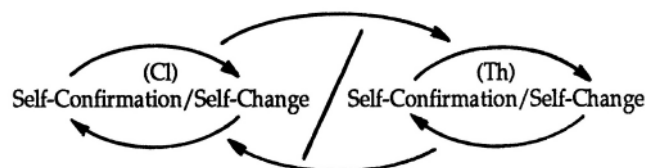
Here the question naturally arises, how the therapeutic process may be constructed as:
a) a means of influencing and/or eliminating the client's problem
b) an unspecific process of reciprocal perturbation according to certain patterns
c) a conversation in which meaning is generated and negotiated.
Although these questions are central to the therapeutic process, I will not pursue them here. My concern is rather to present a few even more basic ideas which will serve to clarify the fundamental therapeutic concepts and processes.

A Brief Excursion

The following account is oversimplified to the point that some colleagues may take exception. I request their patience, however, for the sake of a clear presentation.

The parties of a therapeutic system discuss primarily, of course, the client's problems and/or how to solve them. Traditional family therapists—to put it simply—construct problems on the genetic matrix (background, context) of the family. This means that the family produces (generates, invents, determines) a problem:

Since, in the framework of systemic family therapy, family and system are identified, we may write:
(e.g. client or therapist)

Goolishian & Anderson have objected, again putting it very simply, that problems trigger the organization of systems as a response. To a child's problem at school

belong, for example, not only the parents who discuss it but also the teacher, etc., i.e., all parties in communication on the problem.

This assumption can be represented, again greatly simplified, as follows:

PROBLEM produces SYSTEM
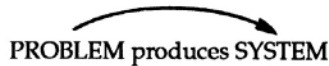
Those used to thinking in terms of recursive unities will respond to the question "which came first, the chicken or the egg?" immediately with the meta-question "why not view the two as components of a single recursive unity?" Accepting the proposal, one is led to the following result:

PROBLEM produces SYSTEM
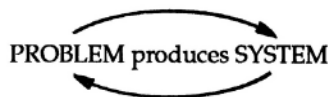
The final unity may be termed the *problem-system.*

Returning to the therapeutic system consisting of client and therapist, by excluding from consideration all other parties in communication we arrive at a problem-system consisting of those two parties discussing the problems.

I

PROBLEM

Cl   Th
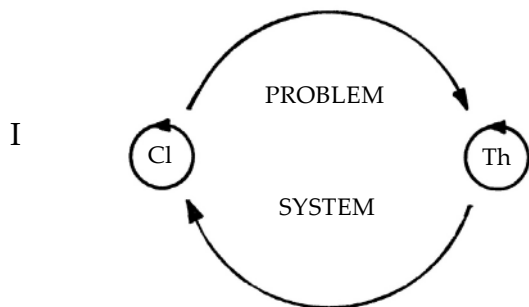
SYSTEM

Of course, these systems also discuss solutions (cf. DeShazer, 1988). We called systems organized around problems *"problem-systems,"* but we may just as well term them *"solution-systems."* Their members discuss solutions; they are organized around solutions. Thus we arrive at a second point of view: *systems produce solutions and solutions produce systems...*

A solution-system can be represented as follows:

II

SOLUTION

Cl   Th
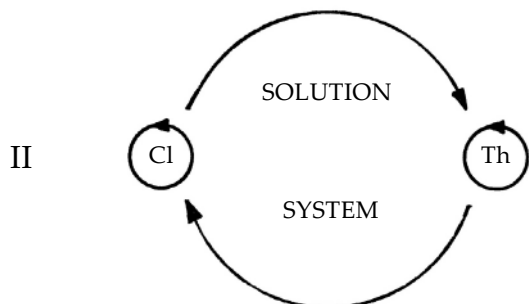
SYSTEM

Recently, Goolishian and Anderson have suggested speaking of *linguistic systems.* In my opinion, only this formulation suffices to finally resolve the conflict between "the system produces a problem" and "the problem produces a system" or "the system produces a solution" and "the solution produces a system" (cf. also Hoffmann, 1985a).

It then no longer makes a difference where one begins, for the two belong together. The linguistic system can be formally depicted as follows:

PROBLEM / SOLUTION = I / II = Linguistic System
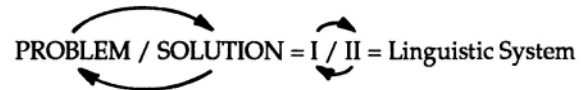
How Can Recursive Therapeutic-Process Models Be Constructed?

Returning now to the separation of *observer and observed*, if we want to reconcile this distinction, to make the map the territory, then I believe we will have to change first our understanding of therapy and second our practice of it. How can we do this, how can we arrive at what Hoffman (1985b) calls *second-order systemic therapy?*

For one thing, we can no longer act as though there were distinct entities such as families which we treat and which exist independently of our observing them. Of course, we can distinguish linguistically between ourselves as therapists and those we treat as clients, but we must tie them in to each other. That *is, we construct our clients and our clients construct us.* In other words, we—clients and therapists—together form a new recursive unity of higher order, namely the *therapeutic system.* The therapeutic system is, of course, also a *linguistic* or *conversational system.*

As is well known from classic systemic therapy, e.g., the Milan model, this distinction is complicated by another which is introduced, still from the classical "objective observer" standpoint. We distinguish those on one side of the one-way mirror from those on the other, therapist and clients from advisers and observers.

If we wish, we can construct a *hierarchy of observers* ad infinitum. Only by applying, e.g., von Foerster's recursive, infinite operations do we recognize the characteristics of a distinct recursive unity, one which operates on itself: *self-observation*, for example.

Classical systemic therapists unfortunately tend to make the mistake of attributing to families characteristics which they consider independent of themselves as observers. They thus try to smuggle in a certain *objectivity of observation* or to *control the experiment.* The observer is to describe as *objectively* as possible the *characteristic patterns of behavior* of the system "family" without exerting any influence himself. As we know from now-familiar sources, this is no longer necessary; the characteristic behavior of the client-system can only be determined by that system itself.

I would now like to present a couple of small models (4) which permit description of the therapeutic system as a recursive unity in which clients, therapists and observers work together, and the artificial cleft between *the family's objective characteristics* and *the objectivity of the observer* is eliminated. It should become clear that *the entire therapeutic system has an effect on itself and thus becomes a "true" recursive system.*

Model I: Classic Individual Therapy

The recursive contextualization by a therapeutic observer can be illustrated by the following simplified model.

Model I: Classic Individual Therapy

Cl = Client; Th = Therapist

1st to nth session

I. *Preparation?*
II. *Interview*
III. *Review?*
IV. *End of Therapy*

Cl   Th
Cl/Th
Cl   Th
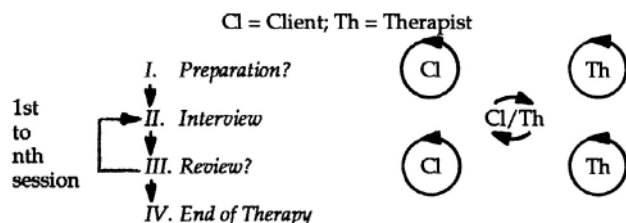
As is clear from the model, there are three types of recursive loops involved, namely:

a) the *recurring sessions* (left side of the illustration)

b) the *interaction between therapist and client* in those sessions (right center).

c) the *recursive subcomponents* of that interaction: Cl and Th.

As is well-known, within the model of individual therapy there are brief and long-term therapies. The number of sessions varies between one and over 1000, which means that the recursion resulting from the repeated sessions is often confirmed.

We will not pursue the details further; the illustration is intended simply to clarify the differences from systemic therapy. The aspects of classic systemic therapy which are absent are:

a) the two-chamber system, connected by a one-way mirror

b) the cooperating team members behind the mirror

c) the possibility for interaction between observers (team members) and therapist and/or client during the therapy process.

Model II: Classic Systemic Therapy

As you know, the classic approach to systemic therapy employs a two-chamber system; the two chambers are connected by a one-way mirror. While the therapist conducts the interview in one chamber, his colleagues see and hear the conversation from behind the mirror in the other chamber. A typical session goes through six steps. The Milan school in particular is known for having advocated this method. The approach has received worldwide recognition and has become part of the standard repertoire of systemic-oriented therapists.

The illustration should serve to clarify this approach. In the left column are the six classic steps; the right column presents the various corresponding recursive unities.

Classic systemic therapy has four essential characteristics.

1) The therapist acts as a *double-agent*, working in two separate fields of operation.

As the diagram shows, the therapist frequently changes his field of operation. First he is part of the therapeutic team (I); in conducting the interview, he becomes part of the therapeutic system (II); then he confers with his colleagues in the team reflection (III) and transmits their results to the clients, possibly discussing them (IV); finally, he reviews the session as part of the team (V). Thus the therapist can be viewed as a component of two recursive unities:

Th :   ThT/Th   and   Cls/Th

2) The therapeutic team keeps *"secrets"* from the clients. For therapeutic reasons, the team withholds certain information from the clients. Although the team can observe the course of the interview (seeing and hearing it), the client-system cannot observe the team's conference. This results in part from the one-way mirror which has, so to speak, an osmotic effect. Finally, the therapist reports to the client only what the team considers useful or he himself considers appropriate.

3) Phases II through IV can theoretically be repeated as often

Model II: Classic Systemic Therapy

Cls = Clients; ThT = Therapeutic Team; Th = Therapist.

0. Collection of *preliminary information*

I. Preparation Construction of hypotheses or available set of possible interventions

II. Interview Hypothesis-led and/or goal-oriented

III. Team Reflection Construction of new hypotheses and/or key-interventions

IV. Report By therapist to client of team-reflection

V. Review

VI. *End of Therapy*

1st to nth session

Cls   ThT/Th

ONE WAY MIRROR

Cls/Th (co-menting) (5)   ThT (observing)

Cls   ThT/Th (co-menting)

Cls/Th (co-menting)   ThT (observing)

Cls   ThT/Th

Explanation of symbols:

The symbol ◯ indicates a (potential) closing of the recursion. (6).

The symbol ⌐ or ⌐ indicates a complete recursive half-loop (phase II, right; V to I, left).

The symbol ⌐ or ⌐ indicates an incomplete recursive half-loop (phase IV, right; IV to II, left).

as required during a session *(inner recursion-loop).* A practical limit is set, however, by the time allowed for the session, so that a maximum of three interruptions (steps III and IV) is usual. As can be constructed, this repetition presents a special kind of *recursion* or *dosing of the linguistic system:*

The process of constructing knowledge by the therapeutic team is influenced by the interview, since they can hear and see it and the therapist joins the team for consultation. This can be viewed as a *complete recursive half-loop.*

The client-system, however, has no direct access to the team's consultation; the therapist merely acts as a messenger bringing the result, be it a comment, task, or intervention. Thus the client-system receives a filtered message. This can be viewed as an *incomplete recursive half-loop.*

In the second half-loop, the recursion thus does not close completely. This incomplete recursion has been of particular interest to many therapists, although the founders of the approach did not intend this to be a point of special interest. It seems that many of their colleagues liked viewing themselves as *information controllers,* determining what information is reported to the clients and what is withheld. They thus see themselves, implicitly or explicitly, as experts deciding what the clients will be told and what not. This is often justified on the basis of so-called therapeutic responsibility. If we suppose that many therapists did not know exactly what they found so interesting in this approach, then it would seem likely that those who would enjoy being information controllers would also be attracted to it. By recognizing this circumstance and developing new methods, this "control thrill" may be lost.

Model IIIa: Reflexive Systemic Therapy

4) The *outer recursion-loop* indicates that the sessions themselves may be repeated; in practice, however, more than four to seven sessions would be unusual.

An interesting aspect of the outer recursion is the fact that each session can begin at a new level of "knowledge/development" on the part of the therapeutic team or the clients. This assumes that structural changes have occurred within the problem-system by closing of the inner recursion during the session or of the outer recursion as an aftereffect of the intervention.

In total, *seven different recursive loops* occur in this model:

The outer recursion which results from the closing of the recursion at the next session.

This outer recursion contains the inner recursion resulting from interruptions of the session.

These, in turn, are comprised of the recursive sub-unities ThT/T and Cls/Th:

Finally, Cls, ThT and Th can be construed as further recursive sub-unities:

This approach is also attractive for systemically oriented teams for reasons other than those just mentioned. It is, e.g., intellectually demanding and allows the team to speculate on the configuration of the client-system on the basis of their expertise, experience, and creativity. Furthermore, interesting interventions can be constructed on the basis of those hypotheses. Their effects can then be anticipated.

Anyone who intends to work systemically nowadays should certainly be familiar with these methods and have mastered them fully. Even if he or she only rarely makes use of them later, these methods are valuable in understanding systemic therapy processes and their effects.

To use a metaphor, mastering the six-step model is like practicing the variations of a cadenza or practicing portraiture; both musician and painter must practice the basic techniques of their arts. Later, they may turn to more abstract forms or develop new forms of their own.

In order to become familiar with systemic methods, it is therefore valuable to practice this approach until it becomes almost automatic. It can then be "forgotten" in the way that, e.g., one might forget the techniques of meditation and later employ them subliminally. Later, too, further systemic methods can be learned.

Model III: Reflexive Systemic Therapy

In the model of classic systemic therapy, information control resulted from an incomplete recursive half-loop; it is natural to ask how one might arrive at a method containing a complete recursion.

It is remarkable that in therapeutic simulations (role playing) there has never been any difficulty in producing such a complete recursion, whereas in live therapy situations this has proven much more difficult. For a complete recursion can only be achieved by providing both clients and therapist with the possibility of full observation and co-menting. This new possibility was first described by Andersen (1987).

The diagrams on this page and the next page illustrate the approach.

Model IIIa: Reflexive Systemic Therapy

Cls = Clients; ThT = Therapeutic Team; Th = Therapist.
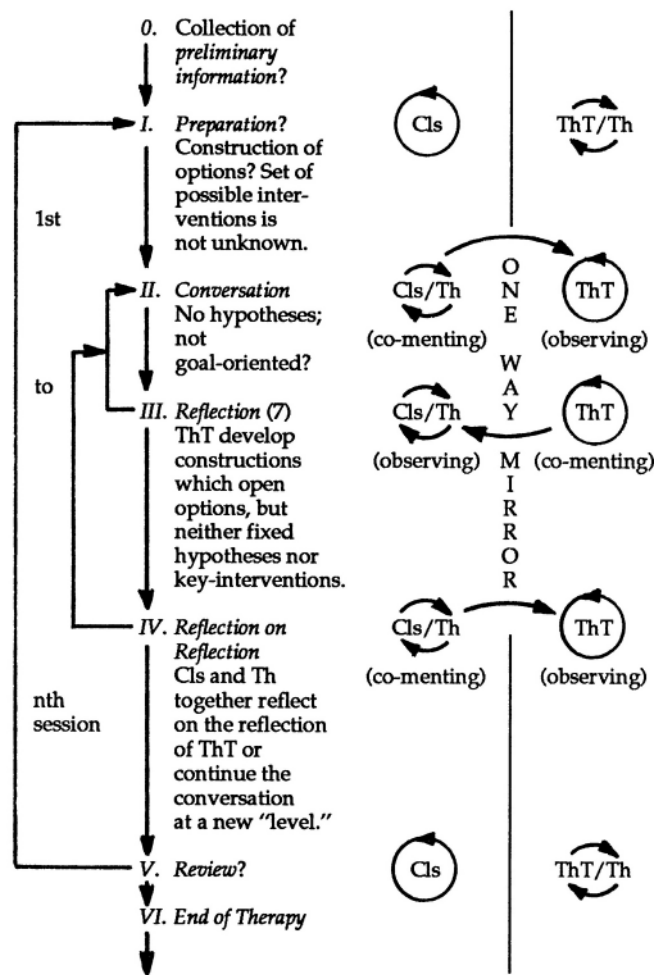
Explanation of symbols:
The symbol ⬛ or ⬛ indicates a complete recursive half-loop.

There are two ways of implementing Model IIIa:

Change of rooms: Therapist and clients exchange rooms with the therapeutic team. The latter reflect on the course of the session while the former hear and see their consultation from behind the one-way mirror. The exchange can be repeated any number of times.

Switching: Given the appropriate technology, lighting and audio are switched to give the effect of the above room-change without actually having to change. Here too, of course, the "exchange" can be repeated.

There are also two ways of implementing Model IIIb:

The therapist joins the therapeutic team (III) and at the same time the observation conditions are reversed either by changing rooms or by switching.

The therapeutic team occupies the same room as therapist and clients, but seated somewhat apart from them. The therapeutic conversation can be interrupted for the purpose of reflection. The therapist may then temporarily join the therapeutic team; after reflection, the therapist rejoins the clients.

It is worthwhile to compare the reflexive model with the classic model of systemic therapy:

1) In both versions (a and b), the *reflecting team* constitutes and important difference from the classical approach. The clients can observe the therapists and co-ment on their behavior just as the therapists can observe and co-ment on the clients. Only

Model IIIb: Reflexive Systemic Therapy

Cls = Clients; ThT = Therapeutic Team; Th = Therapist.
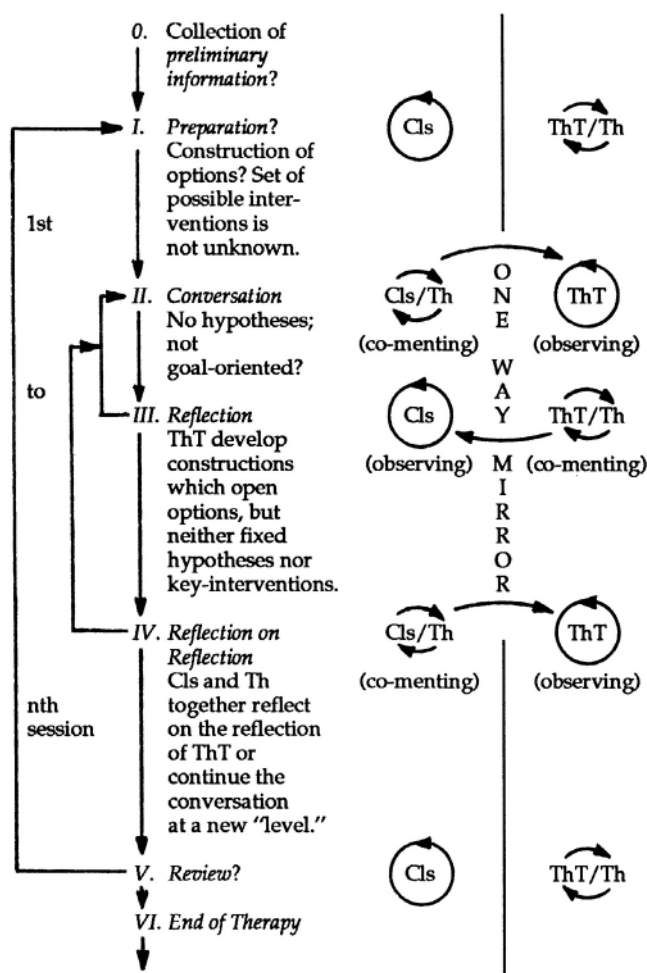
in this way is *the* condition of *the cybernetics of cybernetics* met, namely the observation of observation. Therapeutic team and clients can observe and comment on one another. Thus there is a *complete closing of the recursion.* Each party can observe and comment on the other under the same conditions.

Another way of putting it is that the *reciprocal calibration* between, e.g., Cls/Th and ThT is more successful. The *fine-tuning* between clients and therapeutic team occurs directly and without great intermediate steps.

Furthermore, a greater *overlap of triggering mutual self-confirmation* is achieved. This is conducive to the client's desire for self-change. One client, for example, who was familiar with both techniques, expressed this aspect by saying "one feels better understood and so is more willing to change."

It also becomes more difficult for the therapeutic team to keep secrets from the clients (the converse was already the case in the classic model; it was difficult for the clients to keep secrets from the team). The therapy process thus becomes more *transparent from both sides.*

2). These factors open the possibility of discontinuous co-mental (construction) processes. The therapeutic team can reflect on the material provided by the clients' self-portrayal and the clients on the reflections of the team, and so on. The process can be seen as taking a course through different *levels.*

3) The observation of observation occurs within a framework permitting greater *authenticity.* The observer can see and hear the speaker, permitting attribution of utterances and communicational acts directly to their source.

4) Of course, there remain differences as compared to a "normal conversation":

a) The *reflections are ritualized,* i.e., the session cannot be interrupted too often or at just any point. Although it is possible for the clients to request a comment from the therapeutic team, in practice interruptions are implemented by the team or therapist.

b) The room in which the conversation is conducted is still equipped with *audio and video devices and a one-way mirror.*

5) There is also a small but significant difference in the reflecting teams of the two models:

Model IIIa: The therapist remains a component of the client-system; he does not join the team as in the classic approach until the session is over. In model Ma he and the clients hear the views of the team together. He can then request the clients to comment on the team's deliberations. They in turn can accept or decline the offer to give comments. In this way, the therapeutic team can present their own views without being directly influenced by the therapist. One possible disadvantage for the therapist may be that he feels pushed too far into the client-system and so finds it difficult to retain the meta-position.

Model Mb: This is a further variation of the systemic approach. As in the classic approach, the therapist moves from the client-system to the therapeutic team. There, he can participate in the team's discussion which the client-system observes. The therapist has the possibility of presenting his views in the team; this may be a disadvantage for the team, since he may there appear a more competent observer of the clients. The advantage for the therapist is that he can detach himself from the client-system and develop a different point of view in the team reflection.

6) It will be seen that this model consists of the following eight *recursive loops:*
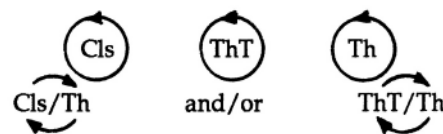
Inner recursion 1 (reflection)

Inner recursion 2 (reflection on reflection)

Outer recursion

The important difference between this and the classical approach, however, is that here the recursions are complete and closed in both directions. Both the client-therapist unity and the therapeutic team participate in a recursive conversation process.

Model IV

Do not be alarmed!

It may well be that the reader is growing weary of recursions, models, etc., but I would like to present one further approach occasionally employed at the Institut far Systemische Therapiestudien in Marburg. It is used, e.g., in conjunction with training seminars, where the participants have both the personal and technical skills required.

This approach takes advantage of all of the previously mentioned models. It is, so to speak, a combination of the classic and reflexive systemic approaches and results in even further reflexive loops. There occurs not only a reflection by the therapeutic team (ThT), but also a further meta-reflection through the addition of an observer team (ObT); both of these are then open to commentary by the clients, and so on.

Model IV: Second-Order Reflexive Systemic Therapy

Cls = Clients; ThT = Therapeutic Team;
Th = Therapist.; Obt = Observer Team

| = Obt observing, or co-menting from the meta-position.

It is hardly necessary to point out that this model—Model IV—entails still further recursions, etc. (e.g., meta-reflection by the observer team). I will spare the reader any further mental acrobatics by omitting a detailed discussion of this model.

Co-Menting
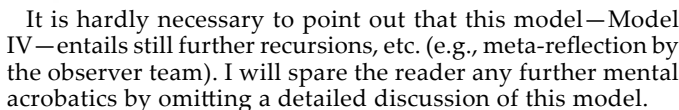
In conclusion, I would like to present a few brief thoughts intended to illustrate how therapeutic processes can, in Bateson's terms, be viewed as recursive mental processes.

The core of Bateson's ideas about mental processes is that they do not occur between the ears of an individual, but between various individual unities which can be viewed as recursively coupled. Mental processes are, therefore, more comparable to interactions than to intra-individual events.

If we now ask ourselves what a therapeutic conversation is, I think it can be said that it, too, is a mental process in therapy in Bateson's sense (cf. also Keeney & Ross, 1986). Systemic therapy, however, usually posits a second mental unity, namely the discussion behind the one-way mirror; thus several dialogues (cf. Andersen, 1987) are recursively tied together. I would like

to propose that we refer to such as *"co-mental processes"* and to the activity itself as *"co-menting"*; co-menting thus takes place when at least two mental processes stand in a certain relation to one other. (8)

As I have tried to show, the important point is how these *mental sub-processes* are related to each other, or to use Varela's terms, how they are *coupled*. As stated above, this seems to occur for the most part linguistically. *New realities are generated in and through linguistic co-menting.*

Summing up all of the above considerations, it can be said that what we do in working with our clients is a *mutual construction of myths or stories.* Therapists thus find themselves, together with their clients, in the practice of making myths or *"mythopoiesis"—as* Szasz or Bateson have also pointed out.

I believe that this standpoint makes it possible to dissolve the distinction between what are classically known as (psycho-) *technology* and epistemology. Psychotherapy is then no longer a technique concerned exclusively with the application of certain strategies, nor is it counterbalanced by an *epistemology in isolation* from its application. The two are unified in therapeutic processes as *poietic processes* which, as *co-mental processes,* intermingle to stimulate mutual *creativity. They are co-mental processes which converse.* In other words, we find ourselves in the realm of poietology, where "the land and the map are reunited," and in which "to speak is to act and to act is to speak."

From the Myth of Power to the Power of Myth? (9)

Finally, we may turn to the metaphors which have occupied our thoughts and influenced our actions as therapists since the turn of the century. Several important ones come to mind: Oedipus, the helmsman, and Hermes. What lends these their fascination?

Oedipus conjures up such colorful and diverse themes as love, incest, guilt, shame, father-mother-son relationships, and so on.

The helmsman, who is the metaphor of cybernetics, led us to believe that we could control and master all behavior through therapeutic intervention and strong manipulation. The stronger the intervention, the better the therapist.

Hermes plays the role of messenger and mouthpiece of the gods, although his function changed with the course of history. He can be associated with philosophical hermeneutics, for he provides clues to the interpretation of texts and stories. Perhaps he can aid us in generating meanings for therapeutic contexts and establishing a tie to the gods, presenting our stories with the "poetic spark" of the lyre. We do not yet know where this course will lead.

I would like to close with two questions which illustrate the thoughts developed here. They are based on a quote from the popular American rock-poet, Willy de Ville. In one of his songs, he sings:
  1) My love is like a storybook story.
  2) My love's as real as the feelings I feel.
I would like to ask:
Is his love *like* a storybook story? Are his actions *like* their descriptions; is the territory *like* the map?
  Or:
Is his love as real as the feelings he feels? Are his actions and their descriptions identical; is the map the territory?

Or both?
More or less?
Neither nor?

A final question: without the poetic spark, is psychotherapy possible as a recursive, co-mental process in which conversations intermingle?

Can that spark perhaps be termed "love"? Do we require access to the gods to achieve it? Must we enter a realm where "fools rush in but *angels fear* to tread"?

Curiosity and not-knowing are attitudes which we need to conduct interviews; are they also sufficient for therapeutic conversations? Is creative cooperation possible without the poetic spark?

Notes

(1) Following Maturana, who puts (objective) reality in *parentheses,* here the "family" will be put in parentheses.

(2) From the Greek *poien* = making, inventing.

(3) It may be noted that *information* can be thought of as composed of novelty and confirmation. Applying this to autonomous systems, it can be said that they are continually producing new information in the form of self-confirmation/selfchange (novelty). In other words, the communicating parties constantly produce information in the therapeutic conversation. This notion of information is incompatible with the technological conception of information (cf. Deissler, 1988a).

(4) Cf. Deissler, 1988b.

(5) This term has been "invented" following Bateson's criteria for mental processes (cf. Bateson, 1979). It refers to the activity of participating in or producing a mental process with others.

(6) I use the phrase "closing of the recursion" rather than "recursive closure" in order to stress that the recursion is a "soft" process resulting from (inter-)action rather than a "closed," inflexible unit. Thus, e.g., a recursion closes when two individuals join in a game, and it dissolves when they end the game.

(7) Note that reflecting and co-menting are somewhat different; co-menting includes both "sides" (Cls and ThT).

(8) In these terms, the therapeutic conversation becomes a co-mental process occurring in and through language.

(9) Cf. also Deissler, 1988c.

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Comments on "Co-Menting: Toward a Systemic Poietology

By Tom Andersen (University Tromsø, NORWAY). Copyright 1989 by Tom Andersen.

On page 3, you write "the map is speech and the territory is action"—it depends on the language one uses in describing "map" and "territory." Map can be something standing still or moving, depending on the use of language in the act of describing it. So also with territory.

The more difficult parts to comment on begin toward the end of page 2, about (as I read it) co-creation of new meanings, through pages 4 to 9, which comprise a lot about structures, over to the final four lines on this page.

How can one engaged in a co-creation which is similar to the acts of poetry (including the spontaneity in the exchanges of interaction (including talking)) when one part (the professional) is pre-equipped with ideas about the structures (non-spontaneous frame) the "co-creation" ought to (?) follow?

My main comment is therefore a big question mark to the question: To what extent does structure permit the evolution of spontaneity?

By Lynn Hoffman (P.O. Box 400, North Amherst, MA 01059). Copyright 1989 by Lynn Hoffman.

What I liked was the comparison between Classical Systemic and Reflexive Systemic Therapies. I too think they have outstanding differences, and the problem is how to point them out without hurting the Milan group's feelings. They have given so much to all of us. Also, "reflexive" is a word that covers much of the methodology of this new (or not so new) "interpretive" model that Harry Goolishian talks about. I think he traps us with the word "linguistic, " since I agree with you that it implies that there is less value to kinesthetic communication, or even that it doesn't exist. Jan Beavin Bavelas is doing some wonderful experiments to show exactly how much it does exist. One example, from my point of view, is the remarkable part that trance states play in therapy; these are only partly achieved and maintained by verbal means.

I also love your use of the term "Poietology," since in the beginning was the Word, and so we as therapists regain an important heritage. I already told you how nice is the sequence from Oedipus to Helmsman to Hermes.

As for your last question, I remember someone quoting Jung as asking: Which is younger, Meaning or Life? The implication is that if they are twins, one must come out first, but perhaps there is no older and younger here.

My major struggle with your paper (apart from my difficulty with complex little maps that remind me of notations of symbolic logic) is the basic allegiance to circles. The trouble with the whole cybernetic universe, and this includes some of Bateson, much of von Foerster, and all of Maturana (Varela is a Buddhist, and so breaks free) is the circle metaphor: homeostasis, circular causality, autopoiesis, and now "recursive unities." These are analogies that depend on closed loops; how samenesses stay the same. To apply them to human histories or histories of people talking together is to stretch them too much. Recursive Function Theory is (I think!) a mathematical theory that says if you feed the results of a computation back into the same operation, the outcome will be that the program begins to spit back the same and always the same final answer. And, of course, your pictures of recursions take on the shapes of little round things, where I would prefer a widening gyre (spiral form) or a river of action somewhat like an eternal Slinky, where co-menting keeps being applied to previous co-menting, with no set goal in mind. That, I think, is the meaning of "reflexive." It doesn't have to be a loop, whether complete or incomplete. And I think it can be applied to the circular questioning and the concept of the Classic Systemic mode (Milan), so we are not in the position of abandoning this mode entirely and doing violence to our fathers.

Particular comments:

1. Page 2. You use the term "cooperate" in the deShazer sense, but without telling its meaning within its history (a deliberate substitute for the term "resistance"), so the reader who doesn't know would wonder why you use that term.

2. Page 2. The idea of therapist stories having to match client stories is conventional, but some of the post-modern people are questioning that there are such "constructs" inside of people; they hold that meanings are developed in the space between them and have no existence or reality "within" them. Now I think that the idea that people, including therapists, do carry within them constructs, some of which are destructive or unhelpful, is a useful one, but I think that for tactical reasons it might be better to think of such "constructs" as mainly appearing and being maintained between people. They are then best described as emergent meanings that are constantly being renewed, changed, or exterminated. For these reasons, I am giving up my adherence to Constructivism and am moving over to Social Construction Theory in its newer forms. This is in response to some new readings from Kenneth Gergen and an argument (no argument, really) with Harry at Renvyle. I seem to eat so much crow in deserting former intellectual positions that I think I will start to grow black feathers.

3. Page 2, end of second paragraph in the section titled "Therapy: a Conversational Reality?" Not clear whether you mean language patterns or relationship patterns.

4. Page 6. Why use the word "half," as in "half-loop," when you already use the terms "complete" and "incomplete"? Surely a "complete recursive half-loop" is self-contradictory; if it's a half-loop, of course it's not complete. I don't understand.

5. Page 7. Under "*Preparation,*" you say "Set of possible interventions is not unknown." Surely you mean that it *is* unknown. Again, I don't understand.

6. Page 8. "Complete closure of the recursion" with the Reflecting Team suggests that informationally closed system which Maturana calls the nervous system; I would wish to get away from any suggestion of closedness, even in a metaphor. That's why the term "recursion" is such a trap.

7. Page 8. Don't use the term "authenticity"—it reeks of humanistic psychology. I know it is coming back in feminist and new individual therapy theory like self psychology, but I hate it. Who the hell is to say what is and is not authentic, anyway?

8. Page 9. I don't think you can equate map and territory with speech and action.

Thanks for giving this paper to me. I don't intend to shred it to bits, but more to share with you that I am evolving away from cybernetics and concepts of recursive unities, because they are tactically in the way when I do therapy. Otherwise, I think they are perfectly good frames to use, as long as you tag them as frames.

Don't stop writing these really carefully thought about and highly intelligent attempts to describe therapy models—this is the most difficult thing that clinicians can do, simply because in practicing our craft most of us cannot really "see" what it is we really do.

By Bradford P. Keeney (College of St. Thomas, St. Paul, MN 55105). Copyright 1989 by Bradford P. Keeney.

I applaud Klaus Deissler's suggestion to recontextualize therapeutic practice within the creative branches of rhetoric and poetics. His healing of several contemporary stop-gaps in the field of systemic therapy (e.g., "problems build systems" vs. "systems build problems") provides a bridge for him to demonstrate how more intricately woven abstractions and understandings of therapeutic discourse may be articulated. Following Hermes, he suggests we become more open to the evocations of improvisational possibilities. I fully welcome this invitation and look forward to other poetic musings.

By Peggy Penn (Ackerman Institute for Family Therapy, 149 East 78th St., New York, NY 10021). Copyright 1989 by Peggy Penn.

I was very interested in your article—I liked the details of your thinking, especially your designation of the reflecting team experience as a way for the family and the therapists to find their natural "fit." I have just written a speech for Budapest filled with poetry, trying to be persuasive about using a story/narrative metaphor to describe what we do, so though the structure of the two pieces is different, the spirit is similar. Both pieces ask therapists to invite acts of their own imagination when working with families.

I found reading Klaus Deissler's paper energized me and stimulated many reflections as I compared and contrasted my thoughts about theory and practice. I will share only a few:

Client and therapist stories. I agree that the client and the therapist both enter the therapy domain with their own stories and believe that in the process of the client's telling/retelling his or her story, the story changes. I believe that the therapist's responsibility and expertise is to provide a dialogical space and process in which a client's story can be told/retold in a manner that gives the client optimal opportunity for agency—a feeling and capacity to take effective action—concerning the reason for which he or she sought consultation. The therapist's story (combined ideas about and experiences with human behavior, problems, and therapy) provides the backdrop for the therapist's actions (for example, conversational questions) that help create the dialogical space and promote the dialogical process. This is different from Deissler's suggestion (if I understand his intent) that the therapist's story is woven with the client's story; nor do I see the new story or construction as co-constructed in the sense that it is a mutual story. Yes, it is intersubjective, and it is a co-generation of meaning, but I believe that therapy takes place in the realm of the client's story and that what evolves is not the mutual story of the therapist and the client in the usual sense of "co-" meaning equal. I would put "co-" in parentheses. It is the client's story that the therapist, through the creation of a dialogical space and process, consults with. Thus I see the therapist as a consulting author.

Therapist attitudes of not-knowing and curiosity. To put the above differently, I agree with Deissler that therapist attitudes of not-knowing and curiosity promote cooperative creativity and imagination. I believe that when therapy begins with such a therapist attitude, it soon shifts to a mutual (therapist and client) attitude, and a process of mutual puzzling (about what is of concern to the client) occurs. This therapist attitude or position is different from the therapist as a "narrative inventor" who invents or co-invents useful stories. I like Deissler's notion of "inter-mingle." I am still striving to describe more fully the relationship of the notion of intersubjectivity as it relates to the therapeutic conversation, the notion that therapy takes place in the realm of the client's story and understanding, the notion of the therapist as a consulting author, and that in the mutual narrative process, both the client's and the therapist's stories change.

3. Observing systems and models. I agree that one of the most difficult concepts for "systemic" therapists to translate into clinical thought and action is that of observing systems. It is much easier to talk of egalitarian, horizontal, non-hierarchical systems than it is to act as if we truly believe in such things.

I think Deissler's notion of "co-menting poietic process" can help. Certainly Tom Andersen and his colleagues' notion of the reflecting team and reflecting process has done more than anything else to this point in time to free therapists from the bonds of expertise, to encourage respect for and attention to the client's story, and to blur the distinctions between client and therapist, between client and therapist and therapy team, and between therapist and team. I like to take it one step further, to have all conversations public, to have none that the client is not privileged to. I would also like to delete the word "meta" from therapy vocabulary, because it has come to mean "better," although Deissler does not use it in this sense.

Co-co-ments

By Klaus G. Deissler. Copyright 1989 by Klaus G. Deissler. Here are my reflections on the comments of my colleagues.

Tom Andersen, I share your difficult question, "How can one be engaged in a co-creation..." with therapists who are "pre-equipped with ideas about the structures...?" I have to admit that I don't know any final answer to this question—except that one might spell out these ideas and make them negotiable. Speaking for myself, I don't know if I ever will be able to "empty" myself totally of any ideas about structure, etc. Sometimes I think the more experienced I get, the less I need structure in the form of a "security belt," but I also think structure does not necessarily kill poetry or creativity. Sometimes you need simple structures like a pen and a piece of paper to write down some poetry... And what about a therapy dialogue?

Lynn Hoffman, before I say something to your comments in general, your particular comments need some particular answers.

1. I agree.

2. I wanted to say that I believe in both: internal dialogue and conversation among people.

3. I mean both: language patterns and relationship patterns (created, e.g., in our dialogue), and both intermingled.

4. *Complete half-loop* for me is just a complete "one-way": the one-way mirror allows the observing team to *fully observe* the clients (complete half-way).

When the therapist comes back with his therapeutic message as is done in Classical Systemic Therapy, he tells a "filtered version" of the team's discussion (clients could not hear or see the discussion). Therefore I call it an *incomplete half-loop:* only an incomplete picture/scene of the team's discussion is given by the report of the therapist.

Only when both sides are able to observe one another can one say that a "self-observing" multi-person system has been realized, although this achievement is reached sequentially, not simultaneously: a. Complete half-loop: team observing clients; b. Complete half-loop: clients observing team. Both together make the loop complete as a "recursive unit"—a self-observing multi-person system. (This very explanation makes the "loop' notion more important than I wanted it to be.)

5. When I say that a "set of possible interventions is not unknown," I mean that all therapists who are now engaging in post-modern thinking/practice have some history of knowledge and practice of interventions. They can pretend they do not, but their story tells us about strategic thinking and practice—at least I can say this for myself.

6. I agree with your objection. Maybe note 6 on page 10 can make my formulation a bit more acceptable.

7. For me, "authenticity" has no bad connotations. I just mean that clients can hear and see what therapists discuss, and that there is no secret strategic arrangement.

8. As I read his comment, Tom also has doubts about this "equation." Let me reformulate it: dialogue may be seen as map, coordination of action may be seen as territory. At least this might be seen as a widespread prejudice, a premature distinction.

My using circles isn't much due to my affiliation with cybernetics. Simple drawings help me sometimes to make some differences in *understanding by seeing.* These differences are often hard for me to formulate in *words—understanding by reading or hearing.* I agree with you that the language one uses says something about his or her thinking or how he or she relates to his or her colleagues. I agree that cybernetic language often obscures what we are trying to say and heavily implies the metaphor of the "helmsman," the expert who is able to "steer

the problems away." I agree that maybe in hermeneutics we will find a better understanding. My drawings helped me to understand better what I *was* doing. Of course, I hope not to stick to these formulations for the future.

Thank you for reading my paper so carefully, for sharing all of your questions and comments with me, and for helping me to understand better what I am thinking.

Bradford Keeney, thank you for applauding my suggestions. I agree that improvisations are—maybe the most important—parts of music and therapy. I like jazz very much, but often I don't like totally "free" jazz, without myself being able to construct any *structure* (e.g., theme) into it—making some sense of what's happening. I do indeed hope for some future poetic musings—in conversations maybe.

Peggy Penn, since you were in Marburg in 1982, I have felt that we have several ideas in common about "family therapy: science or art?"—the title I gave to the 1982 conference. I hope to see your poetry for the Budapest conference, and I hope that our common story about how to do therapy will evolve in our future dialogues.

Harlene Anderson, your idea of a consulting author of the client's story may be more elaborated than my ideas about the same "story." But I cannot help thinking that the ideas of the therapist are part of the "poetic process" too—I do not know yet how to describe it; "co-menting" was one attempt. I personally would like to confine myself to "opening a dialogical space..." My difficulties begin when I think of myself as a "tabula rasa"—an open space with nothing, or a human being with only "no's": no story, no meaning, no attitude—implying all the premises which are then put aside by linguistically negating them. I do not want to imply that you are saying the "no's"—I am following my own trains of thought triggered by your comment.

I agree with your rejection of "sharing is caring, but meta is betta... "; another concept than "meta" might be more helpful. In this sense, I have tried to make more open the implications of "observing systems in therapy." Thank you for understanding this.

I appreciate your "one step further": to have all conversations public. There is one exception to mention: clients who don't want it.

I thank you all for your interest in my thinking, and for offering your ideas about it. I am looking forward to seeing you in the future and prefer "continuing the conversation" in personal meetings.

A Note from the Editor

I want to thank Klaus Deissler for taking responsibility for the organization of much of this issue. He has done an admirable job of providing the main article and gathering responses to it.

I also want to thank the members of the American Society for Cybernetics who welcomed *Continuing the Conversation* as "their" newsletter for so many issues, and especially Larry Richards, who first suggested our joint venture. This is the last issue of CC which will be sent automatically to all ASC members (you can subscribe on your own if you want, folks!). I wish all the best to ASC officers and staff who are preparing to publish a "real" ASC newsletter. As I myself attend to the task of refocusing this newsletter on the ideas of Gregory Bateson, I recall his soberly cybernetic assessment of the human condition: "Yes, the world repeats itself, such as it is." (*Loka,* Rick Fields, ed., Anchor Books, Garden City, New York, 1975, p. 28)

Book Review

By Gary Ronjak (634 173rd St., Hammond, IN 46324). Copyright 1989 by Gary Ronjak.

Freedom from Stress, by Edward E. Ford ($12.00 postpaid from Brandt Publishing, 10209 N. 56th St., Scottsdale, AZ 85253) is an exciting and well written book that approaches the problem of stress from the perspective of cybernetic control theory. According to control theory, stress is a condition in which a person is experiencing internal conflict, one desire at war with another desire. Based on the assumption that humans and other organisms are complex systems run not by external forces but more by inner motivations and networks of goals, the bottom line is that we create our own stress by our efforts to deal with life problems in ways which are internally inconsistent.

The solution involves having to learn something about how our bodies and minds work. Only after grasping the subtleness of arising inner conflicts can we go on to change the goals and perceptions that led to the conflicts generating the symptoms called stress. Those symptoms are the price we pay for control.

This latest in a series of books by Ford is a true labor of love. As a family counselor and teacher of graduate students in Social Work, he is dedicated in his attempts to make the ideas of control theory *practical. Freedom from Stress* is very successful at teaching control theory by examining problems encountered in ordinary life by ordinary people—not theoreticians and academics.

The book's format is conversational as it follows Ford working with a fictitious couple, individually and together, over several counseling sessions. The problems they encounter provide a cross-section of stresses which clients have brought to Ford's practice over the years—problems easily identified with by the reader. The dialogue is crisp and natural, with thorough presentations of key concepts of control theory (clearly for the reader's benefit, rather than a reflection of verbatim counseling sessions.)

Early in the book, Ford does an excellent job of teaching control theory to his clients. The dialogue is enriched with several poignant examples, demonstrations, and anecdotes drawn from his own family life and from his work with a variety of clients. The discussion is augmented by a very helpful diagram of control theory; I found it helpful to keep an enlarged photocopy of the diagram handy for reference as I progressed through the book

In the second chapter is a very thorough presentation of the way in which the brain constructs its perceptions and creates its goals, according to control theory. Many readers will appreciate Ford's discussion of the characteristics of the levels of control used to form perceptions in the making of one's world. Ford explains how we are driven internally by hierarchies of complex levels of control, all of which constantly need to maintain harmony within the system, while being interdependent.

Chapter three shows how control theory teaches that our brain, as a perceptual system, constructs our own unique set of values, standards, and priorities, and that we make our own decisions. From a control-theory counseling perspective, it is imperative for clients to have a thorough understanding of their thoughts and actions, and how they interrelate. The implication for a therapist working with this model is that he or she is really more a teacher, as Ford aptly demonstrates in this book: he helps his clients look at their own worlds, evaluate what they find, commit to alternative actions when appropriate, and make effective plans.

Chapter five concerns feelings, how they relate to what we want and to how we perceive things. Ford emphasizes that we have little or no control over feelings, so it is imperative to connect feelings to something we want.

In other chapters, Ford explains how to resolve conflicts (the results of incompatible goals, and the very heart of stress): learning to deal with others, setting standards at home and at work, teaching discipline, and teaching people to work together. He offers several helpful guidelines for counseling others, as well as advice to readers on how to explore their own worlds, evaluate their perceptions and priorities, recognize alternative choices, and develop plans to resolve difficulties.

What control theory claims, and what Ford illustrates, is that the only behavior we can control is our own. The only way we can control events around us is through what we do. If people choose what they are feeling and doing, then control-theory counselors can help them learn to make better choices, provided of course that the client is willing to make the effort to do so. In this context, a counselor's job is essentially to help clients satisfy their needs in better ways, so the painful behaviors will stop. What all this boils down to is that our personal happiness (freedom from stress) results from how we construct our beliefs and values, and from how reliably our perceptions match the standards we've set.

As a social worker, I feel indebted to Ed Ford. I know that his hard work has saved incalculable time and effort in my own attempts to understand control theory and apply it to real-life problems. Now when I return to more technical works on control theory, I find them more accessible. While some theoreticians might differ with Ford's presentation of control theory, I agree with William T. Powers's statement in his Foreword to *Freedom from Stress:* "After [the academics] read it carefully, however, they must admit that all the ideas are there, properly expressed, sounding like nothing more than good common sense." This book is quite an achievement. There is something here for everyone.

Volitional Action:
Conation and Control

This massive collection of papers concerned with purposive action, edited by Wayne A. Hershberger, is due out shortly from Elsevier Science Publishers B.V. (Physical Sciences and Engineering Division, Sara Burgerhartstraat 25, 1055 KV Amsterdam, THE NETHERLANDS). Included are 25 chapters, addressing the phenomenon of volition from physiological, systems-modeling, psychological, and clinical perspectives, with contributions by several control theorists. Contact the publisher directly for details on availability and price.

New Book by William T. Powers

Living Control Systems, Selected Papers of William T. Powers is now available. The control theory viewpoint in biology and psychology has gained many supporters recently because of its rigor, its beauty, and its explanatory abilities. This viewpoint was first developed by William T. Powers in the 14 papers included in this book. These papers, first published between 1960 and 1988, provide a thorough introduction to Powers' models of living control systems.

From the Foreword by Richard S. Marken: "Powers has looked at the phenomenon of behavior from a totally new angle and, sure enough, people have misunderstood him and ignored him, but they have rarely disagreed with him. The lack of disagreement is surprising, since Powers' ideas contradict the fundamental assumptions of scientific psychology. Conventional psychology views behavior as evoked motor output; Powers argues that behavior is controlled perceptual input. These approaches could hardly be more different."

Published by The Control Systems Group, Inc., a membership organization supporting the understanding of living control systems. ISBN 0-9624154-0-5, 1989, 300 pages, illustrated, softcover, $16.50 postpaid (KY residents add sales tax). Order from: C.S.G, Inc., Route 1, Box 302, Gravel Switch, KY 40328. Phone (606)332-7606.

Call for Papers:
1990 International System
Dynamics Conference

This conference is scheduled for July 10-13, at Pine Manor College, Chestnut Hill, Massachusetts. Possible topics for papers, posters, workshops, and tutorials include business applications, public policy, economic planning, model analysis, software tools, deterministic chaos, simulation gaming, educational environments, and other developments in theory and applications. Selection will be based on competitive abstracts of approximately 250 words, submitted by November 1, 1989. Final papers for accepted abstracts are due by April 15, 1990. No paper may appear in print before the conference. Send abstracts to Cathy Chazen Stone, International System Dynamics Conference, Rockefeller Institute of Government, 411 State St., Albany, NY 12203. For more information about the conference, contact The System Dynamics Society, Julia S. Pugh, Executive Director, 49 Bedford Rd., Lincoln, MA 01772.

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Continuing the Conversation

A Newsletter on the Ideas of Gregory Bateson

Back to Bateson

With this issue, the *Conversation* returns to Gregory Bateson's thinking as its primary context. You are invited to participate by sending comments, queries, news items, etc. March 15 is the deadline for submissions to appear in CC #20.

Some Thoughts on a Cybernetic Hermeneutics

By George F. Cairns, Jr. (1504 W. Norwood St., Chicago, IL 60660). Copyright 1990 by George F. Cairns, Jr.

(Note: While I take complete responsibility for the final form of this paper, I would like to thank the members of the Gregory Bateson Society of The University of Chicago for their helpful comments on an earlier version of the this paper.)

While the discipline of hermeneutics is still generally though narrowly construed to describe interpretation, particularly of sacred texts (Morris, 1969), a broader vision of this field has emerged in the 20th century. This newer view holds that hermeneutics is a discipline "... concerned with the nature and presuppositions of the interpretation of human expressions" (Harvey, 1987). Much of epistemology is thus contained within the scope of this discipline. In order to simplify the discussion, I will consider a somewhat more limited range of expressions here—those which are expressed in physical forms, such as writings, art objects, etc. I will use the shorthand term "texts" to represent all such expressions for the rest of this paper.

I believe that there are several desirable reasons to explore this field from a cybernetic viewpoint. Here are three that immediately come to mind. First, the processes described seem to be particularly amenable to a cybernetic analysis. Second, this analysis seems to hold the promise of clarifying certain historical difficulties imbedded in the history of Western thought—particularly difficulties in Cartesian dualism. Third, the field of hermeneutics provides a hospitable entry point for new ideas in cybernetics that I believe have the potential to make more genera] contributions in the theological conversation. The purpose of this paper is to briefly sketch some of my initial thoughts regarding the first two points and to perhaps further stimulate the conversation alluded to in the third. What I will do below is describe the hermeneutic problem, very briefly sketch some theorists' strategies for dealing with it, describe a comprehensive contemporary formulation of this problem, and then apply some ideas from cybernetics to attempt to clarify the situation.

The classical formulation of the hermeneutic problem is how to uncover the deep meaning of sacred expression that is removed in space and time from the interpreter. Ultimately, all expressions that arise outside the interpreter are problematic because of the chasm that has been opened by the Cartesian subject-object dichotomy. When I construe the world into subjects and objects, there must always be this gap between what is inside my cognitive skin and the external world.

Typically, hermeneutic theorists have focused their attention on elaborating the nature of either the interpreter (the subject) or the object of interpretation (the text or expression). While they have not denied either, they have attempted to finesse this dichotomy by eroding the boundary from either one side or the other. Theorists such as Schleiermacher, Dilthey, Betti, and Hirsch have attended to the object side of the equation, developing methods and principles to more adequately uncover the meaning of the expression. Others such as Heidegger, Bultmann, Gadamer, and Ricoeur have examined the intersubjective understandings that arise when human beings encounter the texts and converse about this encounter. For an overview of relatively recent thinking regarding these theorists, I urge you to read Palmer's *Hermeneutics* (1969). At least one thinker, Fuchs, has attempted to bridge the gap by asserting that the text becomes the subject and the interpreter becomes the object (Walsh, 1985). What is stressed by Fuchs is that neither the text nor the interpreter is passive in this encounter. They both bring to the situation a history that must be addressed.

Perhaps the clearest formulation of the totality of the encounter with the text is found in the notion of the hermeneutical circle, which describes a cyclic process of understanding a text. It begins with our bringing to the text certain prior understandings that allow us to understand the text. As we interact with the text, our understandings are changed and enlarged. When we next encounter the text, this prior encounter is now included in our preunderstanding (Mudge, 1983). This completes the cycle. What is proposed here is a spiral of enlarged understanding with each completion of the hermeneutic circle.

Gregory and Mary Catherine Bateson (1987) have offered us a different way to examine the hermeneutic circle, by first reconstructing the world to eliminate the Cartesian subject-object dichotomy. They have used Jung's notion of Creatura, which they have broadened to include any system that processes information and reflects on these operations. Creatura thus includes "... systems consisting of multiple organisms or systems in which some of the parts are living and some are not, or even to systems in which there are no living parts" (Bateson and Bateson, 1987, 19). This is a much richer and more flexible worldview than that of dualism. For our discussion, their formulation implies that the interpreter and the text are considered to be within one system. That is, because of the nature of their functional relationship (the interpreter encountering the text and the text being interpreted), there is a functional unity proposed, with no subject and no object. For purposes of the encounter, they are functionally one system or are acting as one entity or being.

While the radical gap between subject and object is closed by focusing on the exchange of information that takes place between text and interpreter, rather than treating them as separate entities, the difficulty still remains regarding how the information from the text can be deeply understood by the interpreter. The constructivist philosopher and developmental psychologist Jean Piaget describes, using cybernetic

notions, just such a process in the development of children, which he calls developing schemata (Piaget, 1954). For Piaget, the child constructs the reality of objects as permanent events "out there" by actively engaging with the world over and over again, while slowly modifying this engagement based on what happens.

If the child's activity results in a close matching of his or her preunderstanding with the thing acted on, he or she assimilates this understanding into his or her cognitive structure. If the activity does not closely match the child's understanding, then the child modifies his or her cognitive structure to more closely match the new information. This process is called accommodation. What results from a large number of these encounters is a dramatically different level of understanding—that there are perceived stable objects outside the child's self. A profound understanding indeed—and one that has resulted in the limiting view that perceived lines are actual boundaries (see Ken Wilber's (1979) interesting discussion of this issue). The child has constructed a radical shift in his or her perceptual view of the world, based on ongoing encounters with the world.

In the case of a linguistically sophisticated adult's encounter with a text, there may also be great differences between the individual's preunderstandings (the cognitive structures dealing with understanding at all levels) and the interpretative task posed by the text. I propose that just such a process as that outlined by Piaget could parsimoniously explain how a series of such encounters could result in the interpreter deeply understanding the text. At least one scholar of hermeneutics has suggested that Piaget's notions of schemata might replace the entire notion of the hermeneutical circle (Hirsch, 1975).

As the hermeneutical circle repeats, it describes a recursive system where the interpreter and the text have re-encounters over time are both changed by the encounters: the interpreter by having his or her preunderstandings changed, and the text by having a changed interpreter in the community of believers/interpreters, who will be offering new commentaries on the texts which will affect his or her own and others' preunderstandings the next time the text is encountered. In other words, the horizons of meaning for both the text and the interpreter are changed with each encounter. While the changes wrought in the interpreter are complex, it is self-evident that the horizon of understanding is changed for the interpreter each time he or she encounters the text. The horizon of understanding of the text is affected in even more subtle ways. The community is always affected, however little, by any one of its members encountering the text. The nature of the encounter and the impact that this individual's encounter has on the conversation within the community is subject to a myriad of factors. That there is an effect is difficult to deny. When the text is again encountered by anyone within the conversing community, it will be regarded in a new way.

In cybernetics, this class of system—where the whole system co-evolves—is called a second-order system. The system does not cycle around some single set point. Rather, it cycles around a set point that is changing in time. The nature of this changing point is somewhat difficult to define. Perhaps it is a horizon of understanding for the community. Or at a more microscopic level, it may be the range of usage of a particular word in context. At any rate, this co-evolution reflects a spiral of meaning.

What is proposed here is not some sort of elaborate subjectivism or cybernetic solipsism. Constructivists such as Piaget clearly view the world as existing outside our cognitive skins. What they (and I) reject is the possibility of our ever directly knowing this world. As the child's task is to construct the world to increase the correlation between what is expected and what occurs, so for many "common-sense" adult conversations, the task is to construct the world in conversation with others such that our encounters with the world can be under stood with as

little dissonance as possible (in particular, I think here about the scientific conversation). It is important to note that other extremely interesting conversations do not have this reduced dissonance as their primary goal—many artistic conversations which stretch community preunderstandings are clear examples. I suspect that conversations involving sacred texts have goal elements of both scientific and artistic conversations.

It seems to me that the notion that we construct reality in community with a conversational group is very primal, and very much like the nature of community described in the Hebrew Bible. Here, cognition is not centered within the individual alone, but rather in a community of conversing people. The community of believers is a group of people who agree on a certain set of rules for the conversation regarding the text to continue.

This ancient understanding is being recovered in a dramatically new way in the Christian Base Communities (CBCs) in Central and South America and the Small Christian Communities (SCCs) in Africa. These communities have a heightened awareness of the circular nature of interpretation. They stress an action component in the circle of interpretation that has had very profound epistemological and social consequences. For a concise epistemological analysis of this process, see the work of Croatto (1987). Holland and Henriot (1986) provide an explicit and detailed application of the process to social analysis and change.

While many people have acknowledged the application of the hermeneutical circle in these communities as an extremely helpful means to resist and reduce oppression, I believe that a more radical understanding has been largely ignored. This is the understanding that these conversing and acting communities, as cybernetic systems, provide us with a means of exploring, in extremely elegant ways, what it is to be a human being. The church has often been described as being the body of Christ. I wonder if the church may be better described as the mind of Christ, using Batesonian notions. I am currently working on a paper that elaborates these thoughts. Let me just say here that my lived experience of participating in the action/reflection conversations of SCCs leads me to believe that these conversations have profound implications not only for the church, but also for the more general human conversation.

These evolving conversations have the texts to contend with because, paradoxically, the texts still stand in their separateness as anchor points for us. The constructivist view I hold is that, while we cannot ever directly experience a text, and while the subject/object difficulty is finessed by considering the text/interpreter as one information system, I still assume that some directly unknowable text does exist in some form. The physical reality of a written text is always available to draw us back to other encounters. While we in our conversing communities provide the text with the only possibility of human expression, so too we are intimately related (really inseparable) in the text-interpreter system. What is implied here is a kind of open canon where our current deep and transformative encounters with the text in our community are held in tension with the physical reality of the closed canon presented to us in the form of discrete sacred texts by our traditions.

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The Theory of Logical Typing: Context and Paradox

By Daniel G. Freedman (Committee on Human Development, The University of Chicago, 5730 S. Woodlawn Ave., Chicago, IL 60637). Copyright 1989 by Daniel G. Freedman.

The theory of logical types (Whitehead and Russell, 1910) states that any logical category must contain members other than the category itself, otherwise paradox is generated. This constituted a major tool for Gregory Bateson's thinking (e.g., 1972), and the present paper seeks to expand these ideas into a theory of context. A higher level (e.g., family) serves as explanatory context for the next lower level (e.g., the individual). A schema of levels and contexts is developed that ranges from DNA base pairs, through speciation, ending in Jung's vision (1916) of Pleroma.

The schema, shown in condensed form below, seems to make it clear that reductionism involves causal explanation from below, while holism involves contextual explanation from above, but neither is seen as more effective. The first is the preferred method for scientific prediction, the second for a sense of understanding. Only in Pleroma do such distinctions disappear.

Logical Typing for the Behavioral Sciences

Level:	Contextual level for:	Examples of paradoxes/problems solved by next higher level:
gene	base pairs	non-selfish cooperating genes
individual	genes	ego-dystonic behavior; disassociation
family	individuals	enmeshment vs. individuation
tribe/culture	family	ethnocentrism vs. exogamy
race/ sub-species	tribe/culture	racism
species	race/ sub-species	niche; symbiosis; mutualism
ecosystem	species	origin of life
cosmology	origins of life	infinity of time/space; dualism
Pleroma	Creatura (all above)	[all distinctions disappear]

Note that this schema makes a decided distinction between reductionistic determinism and its complement (not its mortal enemy), contextual explanation. It has often been said that what the social sciences need is a theory of context, since that term is so often invoked as explanatory. Clifford Geertz (1973), for example, provides many rich instances of culture as contextual understanding. However, he rejects reductionism/determinism, and he explicitly and vehemently denies biological explanation of any cultural difference (or cultural universal). The schema shown above holds that his position is as problematic as is the rejection of context.

Let us go through the schema, starting at the level of the gene.

1. What sort of paradox or problem appears at the gene level that achieves resolution at its contextual level, that of the individual organism? A major theoretical problem for modern biology, for example, involves the issue of how a number of competing DNA strands evolved into a cooperating genome. Certainly, one cannot imagine a noncooperating assemblage of genes in an efficiently functioning organism. The problem is that today's biology starts with the assumptions that competition between bits of DNA is the rule of life and that all life involves descent via such a process. This is wholesale reductionism, and, amazingly, has been enormously fruitful, leading to important discoveries. However, reductionism invariably leads to the chicken-egg paradox, and biologists have taken the shaky position (one that involves as much faith as does belief in God) that the egg came first. A truly sophisticated biology would go both ways, but most of us have difficulty keeping reductionism and contextualism simultaneously in mind. As in the reversible figure-ground effect, we see one or the other, never both.

2. At the level of the individual, an example of paradox is the felt sense that what one is doing is ego-dystonic perhaps to the point of depersonalization. Judged at the level of the felt emotion, one is helpless, feeling perhaps that "I must be crazy." One of the great advances of dynamic psychology (and psychiatry) is to systematically relate such depersonalization to one's familial history, and through such a process of contextualization to relieve the accompanying anxiety. Similarly, in his analysis of why Alcoholics Anonymous works, Bateson (1971) pointed out that in replacing a primary "me" with a primary "we," one experiences, perhaps for the first time, the self in larger context; thus, ironically, as one gives up ego, one gains a superior epistemology and thereby the strength that yields sobriety.

Once again, I should not like to lose sight of the "upward" influence of lower levels, something to which therapists are prone—for example, in devotion to the double bind, a reluctance to acknowledge the enormous literature on the biology of schizophrenia. Let me add that I deem all levels in the schema to be operating simultaneously and in both directions.

The family, too, has its context, and that is usually the ethnic group. McGoldrick, et al. (1982) make the point with example after example. In a personal communication made during a discussion of this issue, McGoldrick termed Murray Bowen's vision of "individuation as mental health" a more or less Southern Baptist notion, quite outside possibility, for example, with a normally enmeshed Southern Italian family. Thus, awareness of the ethnic context may help the family therapist better understand what he or she is up against, and that includes the ethnic context of his or her theory.

With regard to causal influences from below, there is evidence that some ethnic differences may be temperamental, that is, biosocial in nature; a case in point is the demonstration of temperamental differences in Chinese and Caucasian newborns (Freedman and Freedman, 1969).

As for paradoxes/problems at the level of ethnicity, there is the persistent issue of ethnocentrism. "If only Arabs and Jews," we bemoan, "could see their commonalities instead of stressing their differences." Why has such ethnocentric rivalry characterized humankind, apparently from its inception, and why does it crop up again and again in all culture areas? Considerable understanding is obtained, I believe, at the next contextual level, that of species and speciation.

Ned and Ward (1970) have demonstrated that the fissioning of single villages into pairs of antagonistically opposed, ethnocentric units among the Yanomamo of northern Brazil are evolutionary events. The fact that such fissioning occurs along lines of kinship (lineal fissioning), so that after fissioning each segment is highly homozygous, serves to speed rates of genetic change, as judged by shifts in blood group frequencies. In this most important work, these human geneticists propose that the evolutionary success of humans, including rapid occupation of all continents, has been in large part due to this tendency for human kin groups to fission when kinship becomes too dilute. The upshot of their work is that ethnocentrism is perhaps the best example of evolutionary selection at the group level. However, since most biologists are wedded to approaching such issues from below (reductionism), this work has been largely ignored. Perhaps social scientists who are more open to contextual understanding will give these ideas the reception they deserve.

Now you have the idea; the remaining levels can be treated in similar ways. I am preparing an expanded work in which the levels are discussed in detail.

As one works at and thinks about the simultaneous operation of determinism and contextualism, the essential circularity of knowledge becomes ever more apparent, and one may then be drawn to Jung's mystic solution, the Pleroma. Pleroma was misperceived by Bateson as the nonliving complement to Creatura—a sort of class of all that is not Creatura. It becomes clear in "Seven Sermons to the Dead" that Jung's Pleroma is an *irreal* place, envisioned by mystics of both East and West, in which all distinctions disappear, in which dualities find union, and in which, to say the least, science as we know it is not applicable.

I like positing the Pleroma on purely esthetic grounds. It proposes a place that is outside measurement, outside the finite limits to which even cosmology must adhere. We need such a place to direct our sense that time and space are infinite, and that the Big Bang 13 billion years ago is just not good enough to appease this intuition of foreverness.

Finally, in an extension of the present schema, cosmology is also reached by going more molecular, in an "underarchy" that runs through biochemistry, physical chemistry, and particle physics. Since particle physics and cosmology are for all practical purposes identical, our hierarchy becomes a mandalalike circle, which in turn implies Pleroma:
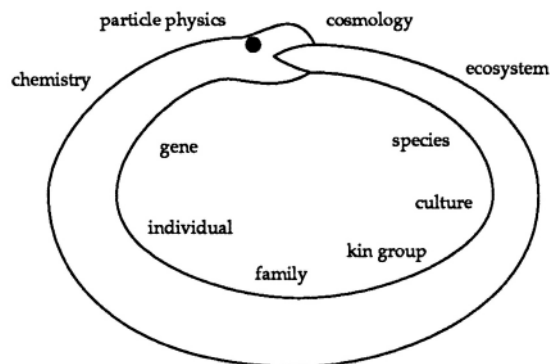
The name of the snake, which is the whole, which is less than the whole, which is more than the whole, which makes no distinctions, and which is indistinguishable, is Pleroma.

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Ecology and the Mind

By M. Elliot Vittes (Department of Political Science, University of Central Florida, Orlando, FL 32816) and Daniel R. White (Department of Philosophy and Humanities, University of Central Florida, Orlando, FL 32816). Copyright 1990 by M. Elliot Vines and Daniel R. White.

(Note: This is an edited transcription of a radio program which aired on September 29, 1989, on WUCF-FM, Orlando, Florida.)

M. Elliot Vittes: Welcome to "Environmental Issue." I'm your host, Professor Elliot Vittes of the Political Science Department

at the University of Central Florida. Today our topic is "Ecology and the Mind." I'm very happy to have as our guest today, Dr. Dan White of the Department of Philosophy and Humanities, to discuss "Ecology and the Mind." And so my first question for you, Dan, is: What is ecological about the mind, or how do we relate the ecology, the ecosystem, to the mind?

Daniel R. White: Well, I think that's a very good question, and in many ways that is the central issue that is addressed in a collection of papers by an anthropologist, psychologist, and evolutionist, Gregory Bateson. Those papers are entitled *Steps to an Ecology of Mind,* and obviously the question is posed by the title: How is mind related to ecology? I think that, in order to answer the question clearly, we have to move beyond our more commonsensical notions of what mind is—as the possession of an individual person, as the personality, as the individual soul—and think more broadly about the concept. In fact I come to the work of Gregory Bateson with a background in classics—classical literature and philosophy—and it's interesting that for the ancient Greeks, the notion, say, of one of the chief components of the mind is idea—we say that I have an idea, you have an idea—but for Plato and for Aristotle the notion of idea is in fact one of the basic divisions and ordering principles of nature, not interior to the human psyche, but inhering in the very structure of the natural cosmos itself, so that when I learn ideas, I am actually learning about the mentalistically-conceived-by-the-Greeks divisions of the cosmos. For instance, Plato's term "idea" is translated into the Latin "species," which is our word for species, and in fact "idea" is used by Aristotle in precisely that sense. So ideas, then, for the Greeks are species. They're natural kinds or types, the divisions and orderings of the world and especially the living, the biological world, which was of chief interest, especially to Aristotle. Bateson uses "idea" and uses the collateral term of "mind" much more in the Greek than in the contemporary commonsensical American sense of the term. So I think that's a first approximation to how ecology will be related to the concept of mind. For, if ecology has to do with the behavior of natural systems, and especially of living systems, then obviously the way in which those systems are ordered is going to be relevant to, in Bateson's terms, mental concepts, mental divisions, ideas in a very broad sense of the term. The ecological question, therefore, for Bateson is: How do ideas interact? How is it that the ideas that we have within our minds and the ideas that we employ in our personal lives, in our thinking, including our science and our art and so on, relate to the larger set of ideas which inhere in the planetary ecology? And that's at least initially how our minds are related to what Bateson would consider to be the larger mind of the natural world.

V: That sounds like a great context to put the discussion of the environment into: the idea that we have to expand our notions and change our contexts in some manner, in order to understand the environment more fully.

W: Quite right, I think. And in fact, if we look then at the notions not simply of ecology, mind, and the context in which we might begin to ask questions in this realm, we can think about, next, the ecological crisis, and how Bateson conceives that as coming about. It's interesting, he's drawn a little model for us in *Steps to an Ecology of Mind* (if you happen to have a copy, it's on page 491). In that, in a paper he presented at the University of Hawaii, he traces the current ecological crisis to three root causes, which are technological progress, population increase, and certain errors in the thinking and attitudes of Occidental culture, i.e., errors in our values. It's under this third heading, for which Bateson uses the Greek term "hubris," which is typically translated as "arrogance," that I think we can make the most immediate connection between our relationship to

nature and the way in which we think. It's there that many of the component theories in *Steps to an Ecology of Mind* converge on a very broad solution to the ecological crisis—in terms of the human sciences and the life sciences, and in terms of the revision of our values.

V: That's fascinating, because if you look at the idea of hubris, we certainly seem in the modern era, in the last 10 to 15 years especially, to have appreciated our potentials ever more so. We were talking last week about satellites and the ability to marry satellites to computers to get more and more information about our physical environment, and so you would expect that that understanding would translate into more progress in terms of solving environmental problems, but I think I'm not misunderstanding you if I would say that in fact it might actually deepen our problems in environmental issues.

W: Conceivably it might, but this requires a little bit of history. It requires us to think back over the development of technology and especially to think through the Industrial Revolution, on what sorts of ideas it's based, and what sort of consequences it has had. Before we go into the specific issue of technology, the problems it might cause and the solutions it might offer, we might consider a myth by Gregory Bateson (really he's borrowed it from Genesis, so he's only rewritten an extant myth) in which he tries to explain how it is that technology fits into human consciousness as an endeavor, at least originally, to dominate, order, and control nature. It is this endeavor which Bateson feels is anti-ecological at its basis. He considers two anthropoids, two hominids, in the Garden of Eden, let's call it. In front of them there's a tree; they spy it—and high up on the tree see an apple. Now the ape, the male ape, Adam, would like to have a bite of that apple, and so would Eve; in fact Eve may well prompt him in this, as the myth goes, but they can't reach it. So, at this point, they begin to think in a linear and rational fashion. They look around, God has conveniently created several apple crates, so that Adam puts apple crate A on top of apple crate B, climbs upon them, and grasps the apple C, thereby thinking technologically in order to achieve a conscious purpose. "I'll get apple C by going through steps A and B in a sequence." Now this is how Bateson defines, mythologically speaking, conscious purpose, and how it may be implemented by techniques. The difficulty, he says, with this process, is as man has developed, he has learned greater and greater feats of technological enterprise, which allow him more and more rapidly, effectively, and powerfully to get exactly what he wants. The difficulty with that is, although he may get what he wants, he gets a great deal of what he does not want along the way. So, for instance, if a person would like to grow more apples—we'll go back to Adam and his apple orchard—he may well find that he is inhibited in this by the fact that there are too many insects which bite holes in his nice red apples; therefore Adam comes up with DDT in order to improve the apple crop. A very simple idea, you sprinkle the apples with DDT, the bugs die, and Eureka, you have lots of apples, at least for a while, until in fact you begin to find out the chain of life has been disrupted because the birds' cycle of reproduction has in fact been ruined by the DDT. Birds can't reproduce, and since birds are the natural predators of insects, in the long run you get more insects eating apples instead of less, as the result of the original conscious intention. So, in other words, the difficulty with conscious purpose as it is technologically implemented is that it oversimplifies the processes of exchange in the ecosystem, edits them, that is, in terms of very narrow human interests, and, amplified by technology, this means that the potential for the disruption of the ecosystem is considerable, in fact directly proportional to the power of the technology implementing the purposes.

V: As you talk, I think of the John McPhee book *The Control of Nature,* in which he talks about the damming of rivers, the shoring up of hillsides in Los Angeles to protect, well not just to protect, but to allow people to live in places where they oughtn't live, I guess, given what nature would like, and as you get more and more into the technological skills of shoring up those hills, the problems become aggravated. More people live there, the potential mudslides that are associated with that become greater, and so the externalities that you've been talking about, I think in one way or another become more prominent and require greater and greater human effort to overcome—new techniques and new ways of thinking, I guess, about the problems.

W: Exactly. Now, if we move back to what seems to be the technological attitude arising out of the Industrial Revolution, the difficulty is that simply by the employment of ever-more-powerful industrial techniques to the problem of getting what we want, that is, of realizing our purpose—whether that be, you know, profit or the good of the people, or whatever happens to be our goal—we increasingly become overpopulated, we increasingly become more powerful, and at the same time, we increasingly get all the externalities, such as pollution, famine, and war, as we come into conflict with nature and one another. So the problem is, therefore, how is it that we can create correctives for the overly narrow, very aggressive and arrogant kind of industrialism which has brought us progress on the one hand, but an ecological crisis on the other.

V: That seems to put us in what I guess is called the double bind, that we have this problem that is created by technology: If we pursue our technology further along the same lines, we destroy ourselves, but if we leave it be, we have many of the same problems of destroying ourselves or not being able to keep up the same standard of living, people will starve to death, and so we have the same—almost the same problems going either way. Does Bateson speak to that, in some meaningful way?

W: Certainly he does, and it's a very interesting concept that he attempts to apply, within the context of his theory of learning. He developed the double bind theory of schizophrenia in order to account for a symptomatology which is typically defined as schizophrenic by psychiatrists in the Anglo-American world. He came to psychiatry as an anthropologist, so that when he looked at families in interaction, and psychiatrists in interaction with families, defining certain patients as ill—certain people as ill—and certain other people as sane, he began to ask a new question: Under what circumstances does the behavior that's called schizophrenic make sense? Under what circumstances is the behavior appropriate? Let's not ask what "disease" this is, so that we can "cure" it, as, you know, the technologist of medicine might well do, by giving the schizophrenic some sort of pill which will calm him down; let's ask why he's acting like he is, and see if we can come up with the conditions that might lead him to do that. So Bateson considered communication, and he asked how is it that schizophrenic families communicate. What he found is very interesting, given his particular theory of communication, which is based on the theory of logical types, developed by Russell and Whitehead. Very simply put, he argues that communication is hierarchical. That is to say that it has different levels of abstraction operating within it. So that for instance if I create a class, elephants, then all the animals referred to by the classifier, the word "elephants," are members of the class. But the word "elephants" is not an elephant, it's a classifier; it's on a higher level of abstraction from the things it classifies; and so on. Bateson said, in the same way, human communication is hierarchic, and it may be said to have different levels. Now, let's go to the situation within

the schizophrenic family. A schizophrenic's mother may well say to him, "I love you dear, will you go to bed?" Right? And when she says that, she may communicate to him on another level, nonverbally, "I hate you dear, you better go to bed and get out of my sight because you make me sick," simultaneously with her verbal message. Now the nonverbal sign, the mood signs, the way in which she says it, the temperament expressed in her voice, her attitude toward her child, may serve as a comment at a higher level of abstraction upon the verbal behavior. In fact, the nonverbal behavior at a different level in the hierarchy of communication invalidates the verbal behavior. But the child is put into difficult circumstance, for, if he accepts his mother's verbal behavior and simply says "She does love me," and goes on—goes to bed—he is not allowed to understand the second message, and is therefore confused by her communication. In fact, if he should respond to her by saying, "Mom, it's so sweet of you to love me," and by hugging her, she might well withdraw. This is the kind of thing that happens: the schizophrenic mother says "I love you," and when the child responds lovingly, she shrinks. And therefore he is punished for understanding her behavior, that is, for responding to it correctly. If she says, "I love you," he should respond in a loving way, but she does not want love, and therefore he becomes confused. Now, it would be all right if the child could say, "Mom, you're sending me double signals; you're contradicting yourself. You say you love me, but I can tell from the way you say it and the look on your face and the attitude you have when I try to hug you, that you don't love me at all. You want to get rid of me." But he's not allowed to say this, because it's his mother, and she loves her child; she's certain that she does. And if he comments correctly, he's likely to be punished for getting the hierarchic communication right. So Bateson says children who are brought up in this manner in their original relationship are punished for correctly understanding the different levels of communication which go on in the natural upbringing of a child. And this puts them in a very difficult situation. The child, if he understands his mother's behavior correctly, then has to say, "My mother hates me," which is an impossible alternative since the relationship is one of very deep dependence. If that's true, then his whole being is undermined. On the other hand, if he says that his mother loves him, then he has to accept a lie. Indeed, the child might well say, "If she loves me she hates me, and if she hates me she loves me." He's caught in a paradoxical bind. And it is very, very difficult for him to get out of this within the confines of the schizophrenic family. He therefore becomes paranoid, distrusting all communication, catatonic, withdrawing from communication, or hebephrenic, trying to correct for what's happened to him by hallucinating or laughing it off.

V: Now of course, that's the extreme case.

W: The extreme case.

V: But in many cases what you are saying is the ability to differentiate between conscious communication and unconscious messages, the ability gets lost somehow.

W: Yes, and this causes a very deep confusion in the character formation or the personality formation of the schizophrenic. Now this brings up a second theory which is parallel to the first, and which is important for understanding its connection to the ecology of mind. That is Bateson's theory not simply of communication, but more specifically of learning. That human learning takes place in a hierarchic fashion, as does mammalian learning, animal learning generally. He classifies learning according to a hierarchic schema from zero learning through learning four. Zero learning is simple response that becomes quite specific, as when you learn it's 12 o'clock by listening to

the whistle blow and you know that all the time. You simply learn that, and there's no more error correction and no more change of response. More interesting is learning one. Typical Pavlovian and instrumental learning are examples. For instance, in Pavlovian learning a dog learns, as we say, to associate a conditioned stimulus, the sound of a bell or a buzzer, with a primary (unconditioned) stimulus, say meat powder, so that he will learn to salivate when he hears the bell. Now you'll notice that originally the bell is a comment upon, a sign for, a classifier of the meat powder. What the dog learns to do, in essence, is to respond to the classifier, and not to the meat powder. So he is said to have learned, in a Pavlovian sense, to substitute the conditioned stimulus for the primary stimulus. In instrumental reward and avoidance, let's say instrumental reward, an animal is presented with a vague unconditioned stimulus, a problematic circumstance, and when he behaves appropriately you reward him. So when a dolphin does tricks, when she does the one you want her to do, jumping out of the water in a certain way, you give her a fish, and the dolphin says "Aha, I've got it right," and repeats that behavior. You give her another fish, and so on. So this becomes learning one again. What's interesting is learning two. Human beings and some animals are capable of learning two. Certainly dolphins seem to be. This is the idea of learning how to learn. That is, learning how to learn at the level of learning one. So that we might expect a dolphin who has learned a series of tricks at the level of learning one might get better at doing that, over time. So when she's confronted with a new situation that the trainer wants her to learn at the level of learning one, a new behavior that she's supposed to exhibit, she will experiment more readily and respond much more quickly after a series of trials, just as you or I, in learning nonsense syllables—which it might seem that we're doing during a foreign language course—after a while, we get better at that. We learn a series of 10 words in half the time, after a couple of weeks, that it takes us to do it originally. We've learned how to learn nonsense syllables. And so Bateson says we learn how to learn. The interesting thing about learning how to learn is, according to him, that what we call character, personality, is formed largely at this level. The idea is that a person who is brought up primarily in Pavlovian sequences will then—this is simplistic, it's more complex than this, but to simplify—a person brought up with Pavlovian sequences, when confronted with new stimuli, will typically wait for some sort of external action toward him, passively, in order to find a new pairing of stimuli to react to. An animal who has been brought up, or a human being who has been brought up in an instrumental context, like the dolphin, will, when confronted with a new learning situation, experiment, try all sorts of different behaviors until he or she comes across the right one, and even if he doesn't, will continue to experiment anyway, because he may not be able to change the premises of his learning. If he's been brought up only in the instrumental context, he may not know that it's appropriate to behave in a passive, not an active way under these circumstances. Now that brings up a question about learning two. Is it possible that we can go beyond that? That is, to learn how to learn how to learn? If it's true that a person brought up in Pavlovian context may be a fatalist, and a person brought up in instrumental context might be an activist, then is it possible that those character traits themselves are subject to change within human beings? Can human beings change their very personalities, their characters, who they are, their typical ways of punctuating the stream of experience, of learning to interact with the world? This is where therapy comes in, this is where education at the highest level comes in, and interestingly enough, where Greek and Shakespearean tragedy come in, as well. To come to the schizophrenic example: When we think of psychotherapy, rather than the schizophrenic family, we may notice that in fact the therapist is in the business of attempting to approach the so-called schizophrenic, and lead him or her

out of the labyrinth of contradiction and paradox into which he or she has been led. So, what the therapist will need to do then, is attempt to present persons with situations which will allow them to learn correctly, finally, to classify communication, and this will require that they change certain premises about communication and about learning which have been formed in the family. That is, the therapist may then well be trying to change the character or the personality or the learning two traits of individuals by leading them toward learning three.

V: So, in a sense, you're saying that what the therapist is trying to do, then, is get the individual not just to change behavior within a context, but to change the whole context for behavior to take place within.

W: To reframe the context itself, away from that learned in the schizophrenic family, and to one that is more in keeping with his or her own well being.

V: Now if we bring that back to nature, because you've laid a nice basis here for nature, and for our approach to it, we get ourselves into double binds, as you said, we change within contexts, it seems, and we keep trying to manipulate the elements of the context—you move the earth here to protect from this happening, and then the ocean undercuts it there, you plan to change nature in certain directions, and then nature responds in a different way. Can you comment upon that in terms of the greater environment, rather than just the mind itself?

W: O.K., to move the context out of the schizophrenic family and into, say, the problem of technology and hubris again, and even indirectly therefore to the drama, the difficulty is the same sort of thing we saw in the parable about Adam and Eve. If we have our two apes again, one of the difficulties with that situation, that scenario, is that when they have for the first time discovered that they can create a linear sequence and get their apple through this elementary technological behavior, they have in fact generalized, or, to put it another way, when they do this a few times, they get the idea that this is the context in terms of which all things should be got. And the difficulty with this is that there's nothing immediately in their environment to tell them that that might be a mistake. So this can become the characteristic not only of Adam and Eve, but of a whole civilization. Indeed that is what it has done; it's called the technological fix. You know, "Yankee know-how " If we've got a problem, what we need to do is to manipulate the world better, to control it better, in order to get what we want. That is a context, and the context for behavior is largely, I think, or becomes after a while, according to Bateson, unconscious; in other words, we have learned to do this, just as the schizophrenic learned to behave. The difficulty is that the technological behavior, just like schizophrenic behavior, is not in the long run necessarily in our own interest.

V: I'm glad you said "in the long run," because I'm sitting here thinking that what you're saying is that technological fixes work for short periods of time. They solve an immediate problem, as you were saying with the apples and the DDT—it gets rid of the insects for a season, or two seasons, or a decade, or two decades, but it runs into the larger externalities. And so, in the context of learning, you're saying that we see situations and we seek solutions to them that we're used to, because they feel right.

W: That's right.

V: But they're bigger mistakes. And they're not thinking in a more abstract fashion or at a higher level, as Bateson, I assume, would want us to do.

W: Yes, in fact, see, this is the problem of hubris. If you go to Greek tragedy, to draw my other example, in the play *Antigone,* Creon, who runs the city of Thebes, feels that he has got to maintain his policies no matter what. His policy is that, you know, one of the sons of Oedipus, Polyneices, may not be buried because he's a traitor. Polyneices' sister Antigone insists on burying her brother, whatever the law says. Creon insists that if she's going to do that, since she has done that, she must be executed, and this is even though his son is engaged to be married to Antigone. His son tries to reason with him, the Chorus tries to reason with him, the prophet Tiresias tries to reason with him, saying, "Look, although you may be a law-and-order man, although you may think that you have this particular way of doing things and the world must conform to it if the world is not going to descend into chaos, nevertheless, bend." Haemon, his son, says, "Bend, father, bend like the trees do when the torrent rises in the river, because if they don't bend, they break." Right? Learn how to change the premises of your behavior. He fails to do it in time, and ends up destroying his own life. And so, in the same way, the idea is that our technological hubris, as Bateson says, may well lead us down the road to tragedy if we cannot raise up to this level and reassess the very foundations of our culture, of the character that we have, and of our typical ways of solving problems.

V: That strikes me very, very strongly, because one of the tools of modern regulation of the environment, of course, is planning, and planning, from what you're saying, planning for nature is somewhat different than designing with nature, to borrow a term from Ian McHarg.

W: Indeed.

V: And the idea is that you bend with nature and you try to design into nature, rather than plan it out and map it out, and that will solve your problems almost as an internal process.

W: Yes, the notion of design, of course, sits deep within the Judeo-Christian heritage, as it does within the history of Greek ideas. But yes, if we learn to design with nature, instead of trying to subordinate nature to our narrow purposes, then according to Bateson, we've achieved another good old Greek ideal: that's called wisdom.

V: Well thank you, Dan White. I enjoyed the interview immensely. Next week we'll have another interview on an environmental issue of interest to you. I'm your host, Elliot Vittes, saying goodbye.

Bateson Study Group in Chicago

Several appreciators of Gregory Bateson are meeting on a semi-regular basis in the Hyde Park area for discussions, presentations, and conviviality. For information on upcoming activities of the group, contact Gary Ronjak (634 173rd St., Hammond, IN 46324) or George Cairns (1504 W. Norwood St., Chicago, IL 60660).

Gregory Bateson-Carl Rogers Dialogue Published

In August 1989, Houghton Mifflin published *Carl Rogers: Dialogues,* which includes a transcription of an acerbic 1975 debate between Rogers and Bateson. (Bateson later noted that he was suffering from indigestion at the time—which may or may not account for his overt contentiousness.) The book also includes part of a follow-up letter from Bateson to Rogers; the excerpt breaks off in mid-sentence, with "regret" but no explanation given as to why more wasn't printed. (Presumably, the original letter is in Bateson Archive, Special Collections, McHenry Library, University of California, Santa Cruz, where it might be available for viewing in *toto.)*

Carl Rogers: Dialogues was edited by Howard Kirschenbaum and Valerie Land Henderson. Its ISBN numbers are 0-39551089-9 (hardcover) and 0-395-48356-5 (softcover).

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Continuing the Conversation

A Newsletter on the
Ideas of Gregory Bateson

From the Editor

Needless to say, this CC is late—very late. I offer no excuses, only a promise to accelerate the production of future issues in order to get back on schedule. Perhaps the next couple of numbers will be combined into one to facilitate the catch-up.

As usual, I welcome submissions: articles, reviews, poems, anecdotes, news items, etc., etc. Comments about previously published materials are particularly encouraged; after all, this is supposed to be an evolving conversation! And please let me know what topics *you* would like to see discussed in this newsletter.

A Meeting of Minds

By Dane Archer, Professor of Sociology, Adlai E. Stevenson Col-lege, University of California, Santa Cruz, CA 95064. Copyright 1990 by Dane Archer.

This is an account of a visit with Gregory Bateson by the psy-chologist Donald T. Campbell and myself which took place on February 6, 1980. John Kitsuse prompted me to write it before my memory began to lose sight of certain events. Don Campbell suggested that I send this rambling set of notes to *Continuing the Conversation* on the chance that it might be of interest.

Don Campbell had met Gregory at the University of Hawaii years before when Gregory was working on dolphin commu-nication; subsequently, Don invited Gregory to Northwestern University. I had known Gregory, although not well, because he—after coming to the University of California, Santa Cruz—taught at College Five, and because I was doing research in an area that he had once been in: nonverbal communication. Gregory was living at Esalen Institute in Big Sur. Don called him to ask if it would be all right to visit him, and Gregory graciously invited us down for the day.

We drove down Route 1 from Santa Cruz. Anyone who has made that trip knows that after you pass Carmel, the scenery begins to change—the coastline becomes much more rugged, much less populated, and more extraordinary in every way. After getting to the town of Big Sur, we thought we might have missed Esalen, and we stopped at a gas station. Without hesitating, the attendant pointed down the road and said it was "twelve miles that way." He had obviously been asked the question many times.

Esalen is on the ocean side of Route 1, a series of houses and public buildings on some very verdant benchland, with a swimming pool on a 150-foot cliff overlooking the Pacific. The coast turns slightly westward there so that when you look south you see a progression of cliffs going off in the distance, and the effect is very striking.

There was a laidback security guard at the gate of Esalen, and we had to declare our intentions and get a clearance before we were allowed into the community itself. The sign says very clearly "by reservation only." We parked near the building called The Lodge—this was a sort of extraordinary window on what Esalen was like in 1980, long after it was the cutting point of the encounter-group movement. The Lodge had posters on it for "courses." One was a course on chanting and meditation. There was another on miracles. And there were other courses which had to do with yoga and other kinds of disciplines.

We met Gregory at The Lodge. He was talking with two other visitors who were obviously his admirers and had come to see him there. I think Don and I expected to find him much changed from before. He was convalescing from lung cancer and a very serious operation. I suppose Don and I talked about this, and I think we both expected to find Gregory relatively immobile and sort of fallen on hard times. We were delighted to see that this was not the case—the big change in appear-ance was that he had gained quite a bit of weight since I last saw him. Otherwise, he hadn't changed. He was still huge and bear-like and even in his old age about six-three or six-four—a very big man. Ever since I knew him he dressed carelessly, as if the act of buttoning his shirt was judged not worth the effort. He always struck me as the kind of person who would wear the same shirt for some time before it was brought to his at-tention, and I think he was *genuinely* indifferent; I don't think that he had it in him to behave like an eccentric. I don't think there was any of that. I think he was genuinely inattentive to matters of that kind. There's a variety of eccentricity where you enjoy having that effect on other people, and I think in Gregory there was none of that. He was a blend of English aristocrat, or English professional, and anthropologist and many other things. He was rather unshaven and, in fact, he might not have had front dentures in position while we spoke to him. There was a stubble of white beard. His hair was whitish and worn long. There were very few visible signs of his nearly fatal bout with lung cancer; one was that when we walked around at lunch (we went up a winding ramp at a restaurant called Nepenthe, ten miles north of Esalen), he did have to stop three or four times to catch his breath, but this could simply have been because he was talking nonstop.

We drove Gregory back up a gravel road from the Esalen lodge building to his own house. He had been invited to stay at this house with his family by the Esalen community, and in return for this, he said, he got a chance to earn his family's keep by giving a seminar for anyone who had an interest. When we visited, his wife Lois and daughter Nora were away in India. The house was in a remarkable setting, a half-circle with the arc trenched into the hillside; its diameter was one wall which looked out over the Pacific, about 200 feet above the water. The sound of the surf was extremely loud, and it was a wonderful sound because it flew up the cliff. Without doubt, the house had the most remarkable view in the Esalen compound; it was probably the highest building, or one of the highest buildings.

When we arrived at the house, before going inside we stopped on a deck outside the glass wall, and that's where we spent most of our time with Gregory, on the deck. I looked over the edge down to the cliff below, and there was a little vignette of Esalen in the 1980s. There were three nudes, I think two men and a woman doing yoga, apparently getting suntans, but in

yoga positions. One was getting massaged. All over Esalen were raised benches, each higher than a dining-room table and covered with a thick mattress. Don said that they looked like they were perfect for Rolfing. The interesting thing was that Esalen seemed to resemble less and less an avant-evangelical social movement, and more and more a kind of nudist colony. For example, from the cliff up there you could look down to the edge of the ocean and see a couple of women doing gardening; they were nude except for gardening gloves, and they were potting little things. So that was the setting. We sat out on the deck most of the afternoon.

The house itself was very much like every other place I'd seen Gregory living. He'd lived on campus in lodging at various colleges, and if you were setting a stage to look like a professor's study, it very well might look like what Gregory ended up with. He had an astonishing range of books on his shelves, from things like the *Tao of Physics* to *The Handbook of Chemistry* and so forth, and anthropology was there as well. The room was in charming disarray. Gregory and Lois were growing seedlings—they had a rack on which there were maybe ten or twelve cafeteria trays, each covered with an inch of soil and filled with seedling sprouts of various plants, none of the conventional ones. Mung beans were not there; wheat and several other crop plants were harvested and used in seedling form. It was explained that Lois was a follower of a diet which called for large numbers of sprouted plants. On the walls there were photographs of Nora and African wildlife. Around the room were several photographs and a painting of an East Indian who apparently was an important religious figure in whom Lois was interested.

Gregory prepared some coffee for Don and me, and I found it very reassuring that it was just as dreadful as the coffee he had made for me in the past. That continuity reassured me that he was in fact the very same man. He always managed somehow to boil it, and burn it, and then you ended up with half a cup of some foul-tasting liquid. I don't know if that was due to his fieldwork, or being English, or whatever.

We talked for about five hours. We arrived at eleven a.m., and we stayed until almost sunset, I guess four-thirty or five p.m. Don talked with Gregory about biology, evolution, and cybernetics. The conversation was one between two people who knew a large number of figures, several of them quite famous. As an illustration, during a discussion of ethology, Don or Gregory, I forget which, said "I first met Konrad [Lorenz] at the Max Planck, but that was years before the Nobel." It was that sort of exchange about people they knew in common. For my part, I asked Gregory a lot of questions about his current works, about his current feelings about reactions to his work, about his illness, about Margaret Mead, about anthropology, and about where he stood and his personal identity right then.

I think the first thing I asked was about his own reflections about his following. I said that as far as I could see, he had a scientific following, but also a sort of groupie following, and I did use that word. He said he was puzzled about that, and knew that large numbers of people seemed to think that he espoused "ESP, magic, and all sorts of things." He appeared not to know, or said he did not know why that was the case, because that was not the identity he saw for himself. He did not believe that he was a mystical figure, or certainly not an anti-scientific figure, and I think he was bothered by the fact that he was sometimes in a position in which he was embarrassed by the people who trumpeted his ideas. My own interpretation of this is that Gregory always seemed to me to have a very enigmatic manner of presentation. He was very elliptical. Rather than use a sort of narrative or linear style to tell a story, he would use metaphor or fable or another device to lead rather than push his listener to a conclusion. His manner was very indirect, I think because he wanted his listeners to

have to work to discover the meaning of what he was saying. I have seen Gregory do that with a lecture to 400 people, and he also did it with us that afternoon, talking about his work when there were just two of us there besides him—it didn't seem to depend on the size of his audience.

My impression is that Gregory actively disavowed many of the elements that have figured prominently in his mystical following. A few years before, at a talk at UC Santa Cruz, a member of the audience asked him what he thought of ESP. With no hesitation, Gregory replied, "It's impossible by definition. Next question." So Gregory had clearly thought about it; of course, his answer was open to a number of interpretations, and I think that's one reason he has maintained a very mixed following: he was rarely unambiguous in his answers. In the ESP exchange, it is true that Gregory chose not to disambiguate what he was saying, and that he could have said, for example, that since every communication requires a sense, there's no such thing as ESP (and that's what I think he meant). But I do think that other people in the room came away with a different interpretation of what he had said, and I think he did not discourage that. Maybe it was his conception of a Platonic method, a Socratic kind of exchange with a group. He seemed unlikely to stake out a position dogmatically, and there was a whimsical quality, too. He told us that he often grew impatient with the anti-scientific attitude or lack of information among some of his admirers; this was true at Esalen. He said, "I have plenty of conversation here. The problem is finding decent conversation." He seemed extremely glad that we had come, probably because Don was well informed on the biological and cybernetic issues which were of greatest current interest to Gregory.

All over the Bateson household and other places as well were pictures of the East Indian mentioned above. They were signed with something like "With greatest loving wishes, etc." When I asked who the figure in the pictures was, Gregory explained that he was an avatar, apparently someone who speaks with God. And apparently this fellow had an extremely large religious empire in India. Gregory said that this avatar, of whom Lois was very enamored or very interested, practiced materialization, to the amazement of his followers. Gregory said, "You know, conjuring up rather gaudy Indian necklaces, out of thin air—that sort of thing." And Gregory indicated that he did have a following, and there was in fact a great deal of interest in miracles at Esalen. I suppose this acquires another level in view of his own recovery from apparently terminal cancer, but anyway, without being explicit, Gregory indicated that he was impatient with this sort of religious following. He said, "I don't really mind that this fellow performs miracles. That's rather obligatory. What I mind is that he seems to enjoy doing it so much."

Gregory seemed to be amused by the extent and nature of his following. He didn't seem to mind the attention, in fact he enjoyed it. He told us that *Mind and Nature,* his newest book, was selling quite well. But what seemed to bother him was that some of the adulation was uncritical, and at least in terms of the biological issues that were increasingly important to him, uninformed as well.

I also asked Gregory about his health. I told him that my colleague, John Kitsuse, wouldn't let me come back to Santa Cruz unless I inquired about how he had survived. He told us this story. He said that, after operating, the surgeons despaired of him; Gregory's phrase for this was "gone by morning." Apparently, he was led to believe that he would not survive. He did have lung cancer in an advanced stage, which had affected (I believe he said) the vena cava, so it was judged to be inoperable. I think they did take out part of the lung, and while they were in there they judged it to be terminal. Three days after surgery, Gregory was somehow still alive. I think he referred to this as something of a "medical surprise." He said

that even at that point he had a very strong will to live, and he heard (I don't know if this was through Lois or not) of an Austrian woman named Mrs. Rodriguez, however improbable that sounds, and she had apparently studied the psychic surgeons in the Philippines. And Gregory or Lois or some friend of theirs was sufficiently open-minded to call in this woman. She arrived at eleven-thirty p.m. on the third day after the operation, and, over the objections of the hospital staff, insisted on seeing Gregory immediately. She bent down over him and listened to his chest for some time. She sniffed his odor and body smell. She seemed very interested in his skin and in the complexion and texture of his skin. Then she stepped back and, grinning, said in a mock scold, "Gregory, you old fraud. The doctors were too late, your cancer is dying." When he said she said the doctors were "too late," that was like a joke on the audience, because when you hear that, you think, "Oh my God, it's all over," when in fact she meant that the operation was superfluous, that the cancer was dying.

The interesting thing about this for Don and me was that—and this was my experience with Gregory frequently—when he told you a story like this, he still kept open a large number of interpretive avenues. So he left Don and me very unsure how he felt about the woman's diagnosis, her method, and the scientific plausibility of this sort of thing. I suspect that he avoided premature conclusions; I think that's supposed to be one characteristic of an imaginative person. Gregory did leave us uncertain about whether or not he really believed in psychic surgery or its possibility. And I think, in microcosm, that explains why he has had such a countercultural following: he left open all sorts of things and possibilities.

Gregory did three things. He had an operation, he saw the woman, and he was using a strategy of imaging one's illness. This was sort of a blend of operant conditioning and placebo effect or something. While we were there, the fellow who was helping with this was actually there. We met him; his name was Simonton. Don knew him. He had a therapy program in which he got the patients to "image" their cancers and to think about their bodies' white blood cells fighting off the cancers. The underlying theory was not clear to me. It had to do with conditioning autonomic processes and somehow really affecting the body's ability to fight the invading cells. There was an article in *Psychology Today* about when people felt Gregory was dying. Dick Alpert, who is better known on the West Coast as Baba Ram Dass, came to Esalen, according to the article, to help Gregory die, to help him sort of adjust to death, to think of death and get ready to shuffle off the mortal coil and so forth. Simonton apparently came at the same time to help Gregory fight to live. In the article, Lois was quoted saying that Baba Ram Dass had come to help Gregory die and Simonton had come to help Gregory live, and that she was delighted to say that Simonton appeared to be winning. So, apparently on three levels, Gregory was working on or thinking about or doing something about his cancer. It struck me that there was an agnostic quality to him in these matters. I didn't know who was guiding the ship, but he was open-minded to these things.

By coincidence, Margaret Mead died from cancer while Gregory was convalescing from surgery. Margaret was Gregory's first wife; Gregory was Margaret's third husband, and she never remarried after they separated. Gregory fathered Margaret's only child, Catherine Bateson. I asked Gregory about Margaret; I'd spoken with him before about her. When I was in New Zealand for a year, I was told by a cultural anthropologist that the lore of the Pacific was that Margaret Mead had gone up the Sepik River in New Guinea with Reo Fortune, her second husband, and had come back down the Sepik River with Gregory Bateson. In her book *Blackberry Winter,* Margaret describes a sort of romantic triangle in the middle of the jungle. Photographs in *Blackberry Winter* show Gregory as an absolutely splendid young man with aristocratic

bearing, a very, very large man dressed, of course, in flashing white British-Imperialist-style garb like turn-of-the-century anthropologists sometimes wore. The photographs show Margaret as a very diminutive figure—she was a very small woman. The amazing thing in that book, for me, was that this anthropologist of remarkable insight skipped entirely over the romantic triangle and seemed downright disingenuous. She said something in there about how she couldn't imagine why Reo suddenly became very sullen and withdrawn whenever Gregory was around—a wonderful passage.

At the University, just after *Blackberry Winter* came out, I asked Gregory about the book, simply whether or not he had read it. He said at the time he knew nothing about the book, not even that Margaret was writing an autobiography. At the time, I thought he might be acting coy. In retrospect, however, I'm convinced that he was telling me the truth, that Margaret Mead in fact did not tell him that she was writing an autobiography in which he was a prominent figure. New evidence of this appeared during our afternoon visit. I asked Gregory if he had seen Margaret's second autobiographical work, *Letters from the Field,* a volume of letters and memoirs of the years of her fieldwork. Gregory also figured in that. He did not know anything about the second book either, and I'm convinced that he was not having a joke at our expense, that he was telling the truth. In part, I think it did show a certain delicacy, that perhaps Margaret did not want to discuss these sensitive things with Gregory. I just don't know what their relationship was like. He always spoke favorably of her; not so favorably of Reo Fortune, although that's not surprising.

In an interesting anecdote in *Letters from the Field,* Margaret told how she and Reo needed to get into the interior of New Guinea, but local tribes were unwilling to take them. She described how they essentially blackmailed the natives: they went around and found out all the secrets of the tribes, then threatened to tell the New Guinea authorities unless they were taken into the highlands. I once took some notes on that for a discussion in a research class on ethics, and when I told Gregory about it, he said it sounded like Reo Fortune. He said Fortune was always scheming and conniving to do certain things. Margaret, that little blushing, diminutive figure, just went along. The amazing thing is that not only did they blackmail the natives into escorting them into the field, they got Margaret carried in a sling up into the mountains. She didn't walk, she was carried up there, which is like a caricature of the Imperialists in some far-off land.

I do think that, in part, Gregory didn't know about these accounts because he was much more oriented toward creativity and writing than toward reading. It reminds me of a Berkeley biochemist I know who once said, with no trace of conscious arrogance, "You have to decide whether you're going to be a consumer of research or a producer of it." Gregory did not seem to read even in areas that he himself had created. I once mentioned to him that I'd read a new article on double-bind theory. This theory, with which Gregory is singularly identified, is an etiological theory of schizophrenia which suggests that this pathological state is created by contradictory demands expressed in different communication channels. When I mentioned the article, Gregory arched his eyebrows in apparently pleasant surprise and said, "Oh, are they still doing that?" As if this entire field were something that, having started it, Gregory had long since moved away from, to new challenges.

Gregory did have an understated sense of comedy that he used, I think, to tweak his listeners. We drove back up Route 1 to take him to lunch. He indicated that this would be a treat for him; Esalen is indeed extremely isolated. Gregory indicated he would love to get out, so we took him to Nepenthe, a nice little unpretentious place perched high over the ocean. The waitress and several others there knew him and addressed him as Gregory, and said "Hi, Gregory" and so forth. So he

appeared to be a regular. There was another group of people at a table about thirty feet away. One of them had a raucous horse-laugh that dominated and interrupted the surrounding conversations. When Gregory was in the midst of making a very complicated point about genetics and the number of stripes on two different species of zebra—after the fifteenth raucous laugh—he turned to me in an aside and said, "I say, can that noise possibly be produced by a human being?"

I asked Gregory about how he came to be an associate of Governor Brown. It turns out that it was through Stewart Brand, who was connected with *The Whole Earth Catalog* and *CoEvolution Quarterly.* Brand knew someone who knew Brown or Brand knew Brown and suggested that Brown meet Gregory. Gregory said that he was taken to Brown's office; Brown had a meeting with some group of politicians or state bureaucrats, and Gregory was waiting in the outer room until eleven o'clock at night. Brown and Gregory talked until two in the morning, and at some point Gregory said, "This is interesting, Governor Brown, but I'm tired." And so Brown asked them what they were doing for breakfast and picked them up and took them to breakfast. After that, I think Brown asked Gregory to give the invocation at his prayer breakfast. And of course Brown then appointed Gregory as a Regent of the University of California, in which role he was very controversial; he published letters written to his fellow Regents which expressed his particular concerns. One of his concerns was with the development of nuclear weapons and nuclear energy. Another had to do with admissions policies, and whether or not they should change the admission criteria, and so forth. I remember that Gregory created something of an uproar when he said to his fellow Regents that it really didn't matter, because from the point of view of the world of ideas, nothing that 99.9% of the students at the entire statewide University ever did would ever matter. He was a gadfly on several issues, including the nuclear issue.

We asked Gregory about his family. In his book *Mind and Nature,* he identified himself as a biologist, and of course I always thought of him as an anthropologist, because he was married to Margaret Mead and wrote *Naven* and (with Margaret) *Balinese Character.* I think Gregory had a kind of serial identity, different professions, and that he was not easily catalogable in terms of the conventional niches of academic life. His work crossed a lot of disciplines. This raises some interesting questions about his family, because his father was a famous anti-Lamarckian biologist who did a great deal to shoot down Lamarck's theory of acquired characteristics. So we asked Gregory about his family, and what he told us leads me to think that his entire career was in some ways a series of coming to terms with issues raised in his family and in his childhood. He disclosed some things to us which I had never heard before.

Gregory said that he and his brothers were raised with the expectation that they would become scientists of some kind. He told us a story about his brother. One brother was killed in World War I, and the other died in an unusual way that obviously had a lasting effect on Gregory. This was an older brother; Gregory was 17 and he was 21; he had been pursuing a hopeless love, and he was very much discouraged in this by his parents. He bought a gun and, after going to see the woman for a last time and being asked to leave by her and so forth, he went to the statue of Eros in Piccadilly Circus in London and shot himself beneath the statue. I think Gregory said that his brother was obviously having some sort of schizophrenic episode. In Gregory's own interpretation, this was in reaction to the stifling Puritanism of the period and particularly of his parents. Gregory said (I asked him about this and he was very clear about it) that the fact that his brother committed suicide under the statue of Eros was not directed at the woman, but at the parents. Gregory said that his parents never discussed girls or romantic things. It was simply never mentioned. He said that his parents and their generation were remarkably

repressive and constricting about matters of love and sensuality, and he said with a smile, "However, they did it with incredible style." So if you examine this anecdote—obviously, it won't bear overinterpretation—Gregory shortly after began his trajectory toward anthropology, which is if nothing else the study of systems of values, and I think it's particularly true that in cultural anthropology the people recruited into it are people who have been at some point repelled by the values of their own culture and are attracted by those of another. In Gregory's own account, there were accidental factors, too. He became affiliated with an anthropologist who had an expedition going to some part of the Pacific. But he was influenced in that direction in relation to the Puritanical values of his parents and his culture. At the same time, you can see the seeds of other aspects of his career, such as his interest in the ideology of schizophrenia, his interest in mental illness.

Gregory edited *Percival's Narrative,* an extraordinary first-person diary from the 18th century of a dissent into psychosis by an Englishman named Percival. On the jacket of the book I noticed that it said Percival blamed his psychosis on his family—his family and the institutional aspects of the society in which he lived. So that in some ways I see in Gregory's interest in Percival his own analysis of his brother's suicide, perhaps.

In his last years, Gregory seemed to have come to terms with his father. In fact, he cited William Bateson in his writings. An interesting thing for me is that Gregory referred to himself as a biologist in *Mind and Nature.* I think all this is a window on why people get interested in things, which of course never shows up in the written work itself.

Gregory's work when we visited was on a book that he was going to call *Angels and Sins* or something like that, about cultural addiction (his own term). He believed that we have become addicted to the use of nuclear power and nuclear weapons, so that we are using slightly more nuclear power all the time and are building up slightly more nuclear weapons all the time. Using the metaphor of addiction, I guess Gregory was concerned about the collapse of the addict at the point where the habit becomes uncontrolled. He told us that in World War II he was in the OSS for some time, and that he was stationed in Southeast Asia, waiting for an invasion of the Japanese army that never came. The reasons it did not come, according to Gregory, were Hiroshima and Nagasaki. Instead of an invasion, there was a surrender. He said that despite this, as early as 1946 he began publishing on the evils and dangers of nuclear weapons. He continued to do that, and led the fight to have the University disaffiliate itself from the Livermore Nuclear Research Facility. I asked Gregory about this. I told him that I believed it was a bomb factory. He thought that they did testing there, but it wasn't a factory. So he continued to be a maverick, a thorn in the side of some of his more complacent fellow Regents.

He also told us that he felt that in his own life, in the early years, he was very unproductive. He said that, for example, he made a trip to the Galapagos to observe evolution-related problems and various species of animals and, unlike Darwin, he came away empty-handed. He did not write up anything about it. He felt that early in his career he in fact was very unproductive and did not feel like a successful person. One imagines that that would be an issue in his particular family. The suicide of his brother more or less left him as the hope of the family, since his other brother also was dead.

When Gregory was invited to Esalen after his operation, it was widely assumed that he was dying and that time was very short. I think he had a sense that time was very short. The product of that period was *Mind and Nature,* which he was struggling to finish before what was seen as the end. When we visited, he was in the felicitous position of having not less but more time than he expected. That's why he was doing another book. I asked him if he was happy at Esalen or would he prefer to spend a quarter in residence at the University. It was clear

that he preferred to be free from entanglements in order to write the final work. But it was a shock to hear him talk about it, because he said things like: "Well, I have to finish the book because I've taken the advance." Somehow, to find somebody like Gregory Bateson operating under that parochial, mundane set of values was surprising to me.

"The Relation Between Rigor and Imagination": Course Syllabus, Fall 1990

By Douglas Flemons, School of Social Sciences, Nova University, 3301 College Ave., Fort Lauderdale, FL 33314. Copyright 1990 by Douglas Flemons.

    This course is purposefully incongruous. As an introduction to the world of systems theory, one would expect to survey the ideas of a variety of systems thinkers, from Boulding to von Bertalanffy, von Foerster to Maturana, Miller to Powers, Wiener to von Neumann. Instead, we are going to focus on the writings of only one theorist—Gregory Bateson—and we are going to examine only a portion of his work.

    The rationale for this approach is quite simple. A survey of the field of systems thought has the potential of becoming isomorphic to a whirlwind tour of Europe: Lots of pretty things can be appreciated, lots of photos can be snapped through train windows, but nothing of the culture can be soaked in. So instead we are going to travel to one village, get off the train, and *live* there; we will learn the language, meet the inhabitants, drink the cappuccino, get tired and dirty working in the fields and the bakery, get drunk on the local wine, and do our best to argue and dance our way *inside* the rhythms and patterns of the culture.

    A systemic mapping of the world can appear from outside the tautological contexture of its relational premises to be simply another paradigm, another way of charting that is different from, but in some sense comparable to, the dominant Newtonian logic informing social science and much of our "common sense." It can be taken as "just another language" to describe and explain. But a systemic approach is a radical departure from other maps—not only because it enables us to know the world in a different way, to know it in terms of what Bateson calls "mind," but because it helps us also fold back and attend to the process of knowing itself.

    This course about mind is about how to think about mind, about how to think about thinking, about how to mind your mind. It is about how to think. It is about how to think differently. It is about how to think differently about thinking. It is about how to think differently about thinking differently. It is about how minds change. It is about how to change your mind about how minds change. It is about "about."

    Reading Bateson is like reading poetry: every word counts, the metaphors are rich and evocative, the ideas connect at many different levels, form and content are interdependent, and the meaning is necessarily slippery, for it resides in *the relations between.* As part of the rigor and imagination of learning to think about thinking, you will be attending to, and interacting with, the course readings with the care befitting a reading of poetic texts:

    Take a look at education now, and of course educators are absolutely terrified of damning anybody, scolding them, really making them do any work. They're terrified of having them learn anything by rote, by heart. And you aren't going to have any poetry in your culture left in another generation if you don't learn things by heart. If you want to know what a poem is about, learn either the whole or chunks of it by heart. Otherwise it won't get to you. It won't get to the less intellectual sides of your brain. (Bateson, interview with John Welwood in *ReVision 1(2),* Spring 1978, p. 46)

Books

American Psychological Association. (1984). *Publication manual of the American Psychological Association* (3rd ed.). Washington, DC: Author.

Bateson, G. (1972). *Steps to* an *ecology of mind.* New York: Ballantine.

Bateson, G. (1979). *Mind and nature.* New York: Bantam.

Strunk, W., & White, E. B. (1979). *The elements of style.* New York: Macmillan.

Schedule

The Week of:

Sept. 20	University closed for Rosh Hashana. Class cancelled.
Sept. 27	Introduction: The Relation Between Rigor and Imagination. *Elements of Style and Publication Manual of the American Psychological Association:* Start memorizing now and continue on throughout the semester.
Oct. 4	AAMFT conference. Class cancelled. *Steps:* 1) Form, Substance, and Difference. Copy this essay verbatim into your journal.
Oct. 11	*Steps:* 1) Introduction: The Science of Mind and Order: p. xvii; 2) Metalogue: Why Do Things Get in a Muddle?: p. 3 *M & N:* 1) Introduction; 2) Glossary
Oct. 18	*Steps:* 1) Style, Grace, and Information in Primitive Art: p. 128; 2) Comment on Part II: p. 153; 3) Metalogue: Why Do Things Have Outlines?: p. 27
Oct. 25	*Steps:* 1) Effects of Conscious Purpose on Human Adaptation: p. 440; 2) Metalogue: What is an Instinct?: p. 38; 3) Metalogue: How Much Do You Know?: p. 21 *M & N:* 1) Chapter 2: Every Schoolboy Knows
Nov. 1	*Note:* For this week only the class will begin at 2:15 p.m. and end at 5:15 p.m. Please adjust your schedules accordingly. *M & N:* 1) Chapter 3: Multiple Versions of the World; 2) Chapter 4: Criteria of Mental Process *Steps:* 1) Metalogue: About Games and Being Serious: p. 14
Nov. 8	*Steps:* The Cybernetics of "Self": A Theory of Alcoholism: p. 309; 2) Conscious Purpose Versus Nature: p. 426
Nov. 15	*M & N:* Chapter 5: Multiple Versions of Relationship *Steps:* 1) Comment on Part V: p. 465; 2) From Versailles to Cybernetics: p. 469; 3) Metalogue: Why Do Frenchmen?: p. 9
Nov. 22	Thanksgiving. Class cancelled. *Steps:* 1) Metalogue: What is an Instinct?: p. 38

Nov. 29	*Steps:* 1) The Logical Categories of Learning and Communication: p. 279; 2) Metalogue: Why a Swan?: p. 33
Dec. 6	*Steps:* 1) Epidemiology of a Schizophrenia: p. 194; 2) Toward a Theory of Schizophrenia: p. 201; 3) The Group Dynamics of Schizophrenia: p. 228
Dec. 13	*Steps:* 1) Minimal Requirements for a Theory of Schizophrenia: p. 244; 2) Double Bind, 1969; p. 271; 3) Ecology and Flexibility in Urban Civilization: p. 494
Dec. 20	*Steps:* 1) Form, Substance, and Difference

Your Responsibilities

This is a course about mind, about knowing; you will be doing a lot of thinking about thinking.

1) You will be keeping a journal of ideas. Purchase a notebook that is bound in some way and has paper which is *not lined.* A sketching pad, obtainable from an art supply store such as Pearl Artist and Craft Supply (1033 E. Oakland Pk. Blvd., 564-5700), would be appropriate. The paper should be of good quality, either white or off-white. This will become part of your mind, so take care of it. Make sure your name is on it.

2) For *each and every* essay or chapter assigned (except for the assigned metalogues from *Steps),* copy into your journal a *minimum* of 1000 words *verbatim.* Do this only after having read the piece at least once, and preferably after having read it a number of times. Write down those passages that are relevant to you, that you react to in some significant way (whatever that might be). Indicate clearly which essay or chapter you are quoting from. Note that you will be copying "Form, Substance, and Difference" in its entirety (see Oct. 4).

3) As you transcribe pertinent segments, write down your relationship to the ideas; locate your mind in your interaction with the passages you have chosen. Look for connections between these pieces and write those down. Draw arrows. Draw distinctions. Draw pictures. You may use colors if you wish. Through the discipline and creativity of this process, you, like the scribes in the Middle Ages, will be immersing in a way of knowing, and will be illuminating your understanding of the text. Out of this interplay a *con-text* will emerge. Mind has much to do with context.

4) You may add to your noted mind anything from anywhere. Your con-text can be enriched by snatches from your life in any number of ways. Be curious. Be specific. Be focused.

5) All of this will take a lot of time, a lot of discipline, a lot of thought, a lot of caring. The rigor will make it possible for you to fly.

6) Bring your noted mind (and Bateson books) to class *every week.* Come on time (coming late is simply not an option) fully prepared to pose questions, challenge ideas, express confusions, etc. The class will provide an opportunity for you to in-form your knowing.

7) Spend one week cataloguing absolutely everything that you throw in the trash. How many pieces of paper? What packaging? What plastic? How many milk cartons? Soft-drink bottles? Wrappings? How many worn-out pairs of shoes? How many cigarette butts (or do you cast them willy-nilly)? How many disposable diapers? Include in your list everything that you let other people throw out for you: the used car you trade in; the antifreeze from the flush your mechanic does at the garage (and the plastic bottles the new liquid comes in); the plastic tub that contained the sauce the chef puts on your pizza; the disposable straws, cutlery, plates, butter containers, etc., you use at the deli; and so on. Multiply your total by 52. Multiply this by 80 (or however

long you expect to live). Multiply this by 200,000,000. Factor in various sorts of geometric progressions.

8) Write an informed, thoughtful, and respectful letter to the head of a corporation or to a government official about what you discover in #7. Do this early enough in the semester so that you can hand in both the letter and the person's response. Feel free to respond to the response.

9) Compose a researched essay (10-15 pages) that incorporates elements from the course in explicit and implicit ways. The piece should be an original contribution to systemic thought and should be written in impeccable style (I strongly suggest you read and absorb *Elements of Style* and the APA *Publication Manual* before embarking on this). All stylistic and referencing conventions must follow APA exactly.

10) All assignments are due December 13th. Late submissions will not be accepted. You will be handing in:

a) Your journal, which will include everything you have transcribed, composed, and drawn since September.
b) Your trash catalogue.
c) Your trash correspondence.
d) Your essay, composed in finely wrought prose, elucidating some aspect of systemic thought.

I will treat your journal with the same respect accorded other facets of your mind; I will not write in it and confidentiality can be assumed. Everything you compose in your journal will help you in the process of understanding. Welcome the muddle and let there be an interplay between the convergence of understanding and the divergence of confusion. Remember, entropy is necessary for the creation of the new.

a) Your grade will be created in the following way:
b) Journal: 60%
c) Class participation: 10%
d) Trash catalogue and correspondence: 10%
e) Essay: 20%

Marks will be assigned in the four categories according to the following guidelines:

a) Journal: If the minimum requirements are met (as described above) a "C" will be given.
b) Class participation: If you contribute to the knowing of the class—through sharing your understanding and/or your confusion—you will receive an "A." This will necessitate your participating in discussions.
c) Trash catalogue and correspondence: You will be graded on the thoroughness of your inventory and the elegance of your letter.
d) Your essay must be researched and written in academic prose. Anything that detracts from the presentation of your ideas—e.g., typographical errors, problematic sentence or essay construction, APA stylistic or referencing errors—will detract from the grade. No resubmissions will be possible.

Other Books By or About Bateson (in whole or in part)

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What Is the Most Beautiful Question?

By Robert Flannery, 421 Enterprise Dr., Rohnert Park, CA 94928. Permission granted by Robert Flannery for reproduction and distribution.

What constitutes a beautiful question? I believe a question which initiates conversation where none existed before is beautiful. A question which undoes lies and delusion is beautiful. A question which opens minds is beautiful. A question which touches tender areas and leaves them exposed and unharmed is beautiful. A beautiful question nurtures as a soft rain, allowing growth and a greening of the landscape. (Sadly, too many landscapes are becoming landscrapes!) The exceedingly grandiose worldwide multilingual most beautiful question contest spreads like whispers through a prison wall.

Look! The ants are constructing underground. Flowers dance briefly on breezes. Ocean waves a rhythm. Fog gives atmosphere. A cool wind is kissing my face. Yet, on this same stage, men are playing war games with computers and thousands of much too powerful rockets. We're all playing targets, even the ants.

The unfertilized egg asks a question. The spermatozoon answers by entering and joining. Questioning and answering join to live as a new being.

A questioning person is searching, in this case for beauty. Beauty would love to enter and join, but the surface of this world is suffused with anticipation of omnicide. Beauty has taken a vacation. It's up to us to give her a reason to visit us again. We need to open to possibilities, to open those possibilities, and enter and join.

My question:

> If George Bush's grandchildren lived in Moscow,
> would he bomb them?

About Gregory Bateson's Library

By Gregory Williams, Route 1, Box 302, Gravel Switch, KY 40328. Copyright 1990 by Gregory Williams.

When "Reading Suggested by Gregory Bateson" appeared in *The CoEvolution Quarterly* in 1974, I assiduously tracked down the 80 or so books listed there and enthusiastically examined their contents. Then I began to wonder about other books judged significant by Bateson. I was especially curious about which books were in his own library—supposing all the while that I would never have the chance to find out. To my great surprise, I *did* have that chance, and here I want to share some of my discoveries with other Bateson appreciators.

Included in Rodney Donaldson's magnificent *Guide/Catalog* to the Gregory Bateson Archive in the University of California-Santa Cruz Library is a list of around 800 books and issues of periodicals which had been collected by Bateson for his personal library. The list was compiled by Donaldson in November 1983; in September 1985, the library was purchased from Lois Bateson by the U.C.S.C. Library, and those books considered by Donaldson to be "of special importance" were placed in the Bateson Archive. The *Guide/Catalog* also includes a list of 27 books annotated by Gregory Bateson which were either retained by the Bateson family or sold to the John Inns Institute (in Norwich, England) as part of William Bateson's library.

I visited the Archive for a couple of days in October 1988 and—you guessed it—spent most of the time going through the lists. I sorted the books (ignoring periodicals) into a few broad subject (and, in some cases, highly subjective!) categories: Anthropology, Archaeology, and Travel (ca. 150 books); Biology and Environmental Sciences (ca. 110 books); Ancient Greek Studies (11 books); Education (7 books); Horticulture (2 books); Literature (ca. 140 books); Mathematics, Physics, and Technology (24 books); Medicine (5 books); Philosophy (25 books); Psychology and Psychiatry (ca. 120 books); Reference (21 books); Religion (24 books); Sociology, Economics, Law, and Political Science (56 books); Systems Thinking (35 books); Miscellany (22 books); and Unknown (68 books). Considerable scholarship would be needed to categorize many of the "Unknown" books.

Anthropology, Archaeology, and Travel. There are few surprises here: several treatises on New Guinea and Bali; the (older) standards of the anthropological literature—Boas, Malinowski, Radin, Rivers; and, of course, an abundance of works by Margaret Mead. Three unusual titles which intrigue me are *Conflict, Violence, and Morality in a Mexican Village,* Czaplicka's *Aboriginal Siberia,* and *The Dream in Primitive Culture.*

Biology and Environmental Sciences. Eclecticism is very much the rule for this category, with volumes devoted to topics ranging all the way from cell biology to global ecology. However, four subjects predominate. Books on *evolution* include the Norton Critical Edition of Darwin, De Beer's *Embryology and Evolution,* Lamarck's *Philosophie Zoologique, The Natural Selection of Populations and Communities* by Wilson, and *Adaptation and Natural Selection* by Williams. On *animal behavior,* there are *The Social Life of Animals* by Allee, *Growing Points in Ethology, Animal Behavior* by Dethier and Stellar, DeVore's *Primate Behavior,* Eibl-Eibesfeldt's *Ethology, The Play of Animals* by Groos, *Instinctive Behavior, Orientation of Animals, Animal Behavior* by Scott, *Approaches to Animal Communication* by Sebeok and Ramsey, Tinbergen's *The Herring Gull's World,* and *Animal Dispersion in Relation to Social Behavior* by Wynne-Edwards. On *marine biology, Aquatic Sciences,* Carson's *The Sea Around Us, Biology of the Seashore* by Flattely and Walton, *Light's Manual,* and *The Depths of the Ocean* by Murray and Hjort. And, most of all, on both "pure" and "applied" *ecology,* Chute's *Environmental Insight, Ecology at Home,* Fosberg's *Man's Place in the Island Ecosystem,*

Jersey Wildlife Preservation Trust Report, Preliminary Research in Human Ecology, Molokai Studies by Lewis, *Man's Role in Changing the Face of the Earth,* Margalef's *Papers in Ecological Theory, Man and His Environment* by Marx, Odum's *Fundamentals of Ecology,* Pielou's *Introduction to Mathematical Ecology, Ecology* by Ricklefs, and *Human Ecology* by Stapledon. Other books of interest, at least to me, are *The Genetic Basis of Epidemics in Agriculture, Kingdom of the Octopus* by Lane, *Darwin Retried* by Macbeth, *The Natural History of Aggression,* Smith's *Kamongo, Challenge to Survival* by Williams, and Wilson's *In the Presence of Nature.*

Literature. Poets represented include Ammons, Wendell Berry, Brautigan, Browning, Cummings, Eliot, Lawrence, Meynell, Rilke, Sandburg, Snyder, and Stevens. There are works by William Blake and Samuel Butler, of course. Some authors with more than one title are Djuna Barnes, Kenneth Burke, Hermann Hesse, James Joyce, Henry Miller, and William Shakespeare. Additional noteworthy titles: *The Horse's Mouth* by Cary, *The Trial* by Kafka, *Gift Horse* by Knef, *Moby-Dick, Wisdom of the Sands* by Saint-Exupery, *Walden Two* by Skinner, *Of Mice and Men* by Steinbeck, *The Cay* by Taylor, *The Sword in the Stone* by White, and *The Disappearance* by Wylie.

Philosophy. The books include *Albert Einstein: Philosopher-Scientist,* Bergson's *L'Evolution Créatrice,* four by Collingwood, Descartes' *Discourse on Method, Human Destiny* by du Nouy, *Physics and Philosophy* by Heisenberg, *The Sciences and the Humanities* by Jones, three editions of Laotse, *Aspects of Dialectical Materialism* by Levy, et al., LeShan's *The Medium, the Mystic, and the Physicist,* Lippmann's *Preface to Morals,* Lovejoy's *Great Chain of Being, Meta Metaphor* by MacDermott, *The Philosophy of Bertrand Russell* (volume 1), two editions of Plato, *The Ethical Animal* by Waddington, *Prozess und Realitat* by Whitehead, and Wittgenstein's *Tractatus Logicophilosophicus.*

Psychology and Psychiatry. There are many books related to family therapy and schizophrenia. Here is a sampling of titles *not* about those topics: *Studies in Expressive Movement* by All-port and Vernon, *LSD and Mescaline in Experimental Psychiatry, Coming to Terms with Death* by Cutter, *Studies in the Psychology of Sex* by Ellis, Hartmann's *Biology of Dreaming,* several works of Freud and Jung, *The Anatomy of Memory* by Kimble, Kretschmer's *Physique and Character, Laboratory Studies in Operant Behavior, Behind the Mirror* by Lorenz, two works by May, *Mowrer's Learning Theory and Behavior, The Crack in*

the Cosmic Egg by Pearce, Pelletier's *Mind as Healer, Mind as Slayer,* Rosenblueth's *Mind and Brain,* Skinner's *Science and Human Behavior,* Walter's *The Living Brain,* and *A Model of the Brain* by Young.

Religion. The books are almost exclusively *about* religion. Exceptions are *The Bible Designed to be Read as Literature, The Cloud of Unknowing* (two editions), *The Dead Sea Scriptures,* and Hunt's *Buddhist Sermons.*

Sociology, Economics, Law, Political Science. A sampling: Foucault's *The Order of Things,* two works by Galbraith, four works by Paul Goodman, *The American Way of Death* by Mitford, Nakane's *Japanese Society,* Ogilvy's *Many Dimensional Man, The Status Seekers* by Packard, *One-Upsmanship* by Potter, *The Greening of America* by Reich, *The Uses of Disorder* by Sennett, *Freedom in a Rocking Boat* and *Value Systems and Social Progress* by Vickers, *Historical Jurisprudence* by Vinogradoff, and *A Time to Die* by Wicker.

Systems Thinking. Some of the books in this category are *After Brockman: A Symposium,* Berkeley's *Giant Brains, General and Social Systems* by Berrien, *The Dymaxion World of Buckminister Fuller, Limits to Growth,* MacColl's *Servomechanisms,* Michael's *Cybernation: The Silent Conquest,* Ryan's *Cybernetics of the Sacred,* and *Hierarchically Organized Systems in Theory and Practice,* by Weiss.

Miscellany. These range far and wide; the following are picked virtually at random: *The Necessity of Art* by Fischer, Gill's *Autobiography, Bunraku* by Hinonaga, *Improvisation for the Theater,* and *Walter Spies.*

Two Important New Books

Completing Distinctions, by Douglas G. Flemons, Shambala, Boston, 1990, 144 pages, $9.95. "The author [a contributor to this issue of *CC*] suggests that addiction and other social and ecological dilemmas stem from the belief that the distinctions between hate and love, sickness and health, or problem and solution are irreconcilable oppositions."

Free Play: Improvisation in Life and Art, by Stephen Nachmanovitch [a former student of Gregory Bateson], Jeremy P. Tarcher, Los Angeles, 1990, 224 pages, $16.95. 'This book is about the inner sources of spontaneous creation. It is about where art in the widest sense comes from."

FIRST CLASS

Continuing the Conversation

A Newsletter on the
Ideas of Gregory Bateson

From the Editor

I'm still running (far!) behind, but this double issue isn't quite as tardy as the previous issue. With another couple of double issues later this year, I'll be on schedule. Whether that happens depends on *your* participation in the conversation. *Please* speak up soon. Thanks!

Toward a Secondary Bibliography of Gregory Bateson

Compiled by Greg Williams.

Below are listed all articles and books referring to Gregory Bateson which I have collected—rather unsystematically—over a period of several years. Eventually, I hope to prepare a much more complete version, in collaboration with Phil Lewin, to include additional newspaper pieces, articles from foreign-language periodicals, and hundreds of references from various citation indexes. To that end, any and all corrections and additions will be most welcome.

I am grateful to many librarians, scholars, and Bateson appreciators for aiding me in this work. In particular, I thank Wendel Ray, Gary Ronjak, Lewis Ward, Mackenzie Yearsley, and Michael Yocum for providing exceptionally hard-to-find materials.

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Book Review

By Martin B. Mathews (Professor Emeritus, University of Chicago). Copyright 1991 by Martin B. Mathews.

Gabrielle Roth, with John Loudon, *Maps to Ecstasy: Teachings of an Urban Shaman,* New World Library, San Rafael, California, 1989, 212 pp.

(Editor's Note: Gregory Bateson and Gabrielle Roth were co-leaders of "The Shaman and the Anthropologist," Bateson's last Esalen workshop before he died.)

It was early morning after Gabrielle's workshop ("Invitation to Ecstasy") in New York. I was dancing under my seat belt, the workshop music filling my earphones, when I glimpsed the rapid approach of a flight attendant. She, agitated: "Sir! Are you all right?" I, smiling: "Sure, why?" She, puzzled: "But... but, you look so happy!"

Gabrielle Roth's book lives in its metaphor of cyclic change. It offers guidance to a dimly remembered territory, the Stonehenge of our psyches, charting cyclic events of an inner sky of new suns and unnamed planets and constellations. This book is our zodiac. In it, Gabrielle bridges the leap in logic between the "I think" and the "I am" of Descartes' "cogito ergo sum" and provides an answer to the Sphinx's riddle "what is man?"

Many individuals have contributed to the shaping of Gabrielle's "teachings." An unrepresentative sample includes Oscar Ichazo, a shaman, Fritz Perls, the founder of Gestalt Therapy, and Gregory Bateson. Of this trio, the last-named has special relevance to the purpose of this review.

Dance-theater workshops at Esalen Institute were growing in acceptance when Gregory Bateson began attending them regularly. He recognized Gabrielle's teachings as deeply complementary to his own scholarship of 50 years. In the spring of 1980, he joined Gabrielle in presenting a joint workshop. The participation of a scientist-philosopher in the workshop was unquestionably appropriate. After all, dance and ecstasy are intellectual things.

The Maps in this book are available for use at many levels. Taken as a whole, they are guides to a complete life, covering all stages and passages from birth to death. The Maps are presented in condensed form as a great wheel with five spokes, each spoke divided into five cycles. Reading from the wheel's rim inward for each spoke: Birth/Self-Love, Childhood/Friend-love, Puberty/Lovers, Maturity/Soulmates, Death/ Celibacy; Flowing, Staccato, Chaos, Lyrical, Stillness; Fear, Anger, Sadness, Joy, Compassion; Dancer, Singer, Poet, Actor, Healer; Inertia, Initiation, Intuition, Imagination, Inspiration.

The five-fold plan continues with the book's five chapters. These are preceded, however, by a stirring autobigaphical account of life's great woundings and learnings. Gabrielle offers us the keys to the universe of an urban shaman. The final door opens upon an ecstasy which is a sense (trance state) of being totally alive and unified in body, heart, mind, soul, and spirit. We need this sense of unity to heal, i.e., restore the broken connections in, our dismembered psyches. Ecstasy will be our healing.

This succinct characterization of shamanic ecstasy will suffice when completed by the participant's essential personal insights and intuitions gained during the experiential process. However, some will anticipate difficult problems and wish for assurance that rational solutions will be available also. For example, consider three related questions. First, how can I distinguish the above-described shamanic ecstasy from other species of ecstasy within the same general genus? Second, how can I recognize this shamanic ecstasy in myself? Third, by

what outward and visible signs can I recognize the inner and invisible presence of this shamanic ecstasy in others?

Fortunately, Bateson provided solutions to these problems in "Style, Grace, and Information in Primitive Art" (1967; reprinted in *Steps to an Ecology of Mind)*. Following Aldous Huxley's observation that the central problem for humanity is the quest for grace, Bateson proposed that art is part of humanity's quest for grace. It is sometimes our ecstasy in partial success, sometimes our agony in failure. Bateson argued that the problem of grace is fundamentally a problem of psychic integration. The diverse parts of the mind, particularly those parts or levels which at one extreme are called conscious and at the other unconscious, are what must be integrated.

The problem of recognition of states of shamanic ecstasy or grace now appears to be a soluble problem in communication, primarily within a culturally specific context. The communication occurs between conscious and unconscious levels of the mind within a single individual, and between those levels of two or more individuals. Bateson held that "for the attainment of grace, the reasons of the heart must be integrated with the reasons of the reason." Indeed, grace can be identified by this greatly enhanced flow of messages. The art work, in the broadest construction of that term, can be a prime vehicle and indicator of grace.

The first chapter of *Maps to Ecstasy* brings us toward the moving center of our being:

The first shamanic task is to free the body to experience the power of being.

It is first in that it is both where we must begin and what is most fundamental. Your body is the ground metaphor of your life, the expression of your existence. It is your Bible, your encyclopedia, your life story. Everything that happens to you is stored and reflected in your body. Your body knows, your body tells. The relationship of your self to your body is indivisible, inescapable, unavoidable. In the marriage of flesh and spirit, divorce is impossible, but that doesn't mean that the marriage is necessarily happy or successful.

So the body is where the dancing path to wholeness must begin. Only when you truly inhabit your body can you begin the healing journey. So many of us are not in our bodies, really at home and vibrantly present there. Nor are we in touch with the basic rhythms that constitute our bodily life. We live outside ourselves—in our heads, our memories, our longings—absentee landlords of our own estate. (pp. 29-30)

The other chapters are titled "Expressing the Heart: The Power of Loving," "Emptying the Mind: The Power of Knowing," "Awakening the Soul: The Power of Seeing," and "Embodying the Spirit: The Power of Healing." All of the Maps in these chapters are presented with the intent to empower the reader toward Self-Discovery and Self-Healing.

The Maps are, after all, high generalizations not necessarily remote from the territories of the body which they represent. Individual progress toward ecstasy on the dancing path can be made only with art and dedication to personal change. The task is daunting, but all of the tools are provided by Gabrielle, and "the language is our native tongue." Gabrielle gives clear descriptions of and evokes the dancing path as a personal process. But only relatively daring persons will proceed on their own. Most (like myself, who took my first faltering steps with Gabrielle in 1980) will learn best from an experiential workshop under the eye of this great teacher herself.

For each, the journey on the dancing path requires commitment to the high art of living, and it provides reinforcement and affirmation in ecstasy. We shall follow the two-centuries-old prayer "May God us keep / From Single vision & Newton's sleep!" by William Blake, and learn alternate ways of being, knowing, and seeing.

Why Is ESP "Impossible"?

By Steven M. Kemp (L.L. Thurston Psychometric Laboratory, Davie Hall, CB# 3270, University of North Carolina, Chapel Hill, NC 27599). Copyright 1991 by Steven M. Kemp.

I think Professor Archer is quite right that Bateson probably meant that "communication requires a sense" when he said that ESP was "impossible by definition" *(CC* (20), page 2). But he could have meant something more, as well.

Recall Bateson's view that Lamarckian inheritance also had definitional problems. And even with those terminological problems resolved, a Lamarckian process would cause evolution to grind to a halt.

Consider the metaphor of learning and evolution. On that view, the brain (or mind) is analogous to the gene pool of the population. Just as direct effect on the gene pool by the environment (including other gene pools) would, in Bateson's view, put a stop to evolution, creating massive addiction without adaptation, so a direct effect on the brain (or mind) by the environment (including other brains or minds) would prevent learning.

Information made available to us without the mediation of some sense would be information we could not learn from—information which could not inform us. A most useless sort of information, indeed.

Contents of CC Back Issues

Several new readers have asked for details on the contents of early issues of *Continuing the Conversation,* so here they are. All issues are still available for $2.00 each ($2.50 each outside North America via surface mail; $3.00 each via air mail).

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An *Electronic* Conversation?

Would anyone out there like to participate in an ongoing conversation concerning Gregory Bateson's ideas via electronic mail? If you are interested, please phone Greg Williams at 606332-7606 (voice only).

FIRST CLASS

IF YOUR ADDRESS IS CIRCLED IN RED, PLEASE RENEW IMMEDIATELY. NO SEPARATE RENEWAL NOTICE WILL BE SENT!

Continuing the Conversation

A Newsletter on the Ideas of Gregory Bateson

From the Editor

This is the final issue of *CC* which I intend to edit, for several reasons. Most importantly, my attempts to increase reader participation haven't been very successful. And I am spending an increasing proportion of my time documenting attempts to *answer* some of the questions raised by Bateson (in publications which I have been editing for the Control Systems Group, including the quarterly, *Closed Loop;* write to me if you are interested in learning more). Also, I want to finish building the house we started last year!

I would be very happy if someone would like to take over this newsletter (please contact me very soon if that possibility excites you), but assuming that this is really *the* last issue, I want to assure you that if your subscription hasn't expired with this issue, we are prepared to refund the money we owe you. Our records indicate that we owe *you* $_____. If you want a refund, just send us a postcard, and we'll remit that amount in full. Or you can take the refund in back issues of your choice (see the prices listed above, in the masthead). Or you can write it off and thereby make a contribution to the Bateson work which I intend to continue (with Mary Catherine Bateson's kind permission and the gracious cooperation of the Lindisfarne Press): indexing the audio tapes of his talks, conversations, etc., which were in his possession when he died. In any case, thanks for your support in this endeavor. The two-dozen *Conversations* have been enlightening for me.

Exemplary Parables: Stories Bateson Told

Compiled by Greg Williams.

References given below are keyed to Rodney E. Donaldson's "Bibliography of the Published Work of Gregory Bateson," pp. 314-336 in *A Sacred Unity,* 1991. Page numbers refer to the original publications, unless otherwise noted. The "Metalogues," other than 1980d, are not included here, since they are parables entire. Otherwise, I have examined all of the items in Donaldson's "Bibliography" to which I have access (namely, all except 1943f, 'Preface to the 1968 Edition" of the reprint of 1951a, and additional shorter remarks noted with 1963b).

In attempting to provide a sort of "field guide" to Bateson's stories, I have become acutely aware that trying to count stories is a lot like trying to count jokes. The results of such activities need not be similar for different counters. For the purposes at hand, I have *usually* considered a story as (1) used as an illustration to make a point, not for its own sake (as, say, anthropological data); (2) anecdotal; that is, particular and actual, not general or hypothetical; and (3) having a beginning, a middle, and an end. But I suspect that some readers will discover that at least a few of the "stories" included here lack (1), (2), *and* (3). And some will discover stories which I have missed. Good!

1935a, "Music in New Guinea."

161-163: Bateson's purchase of Iatmul flutes; concerns of Iatmul men about women seeing the flutes and about Bateson taking the flutes home, where they wouldn't be played; "no practicing in public" rule; Bateson's (not very successful) attempts to learn to play the flutes

1937, "An Old Temple and a New Myth."

315-316: stone in Iatmul village to memorialize women who had gained alliance with another village in warfare

1941a, "Experiments in Thinking About Observed Ethnological Material."

56: Iatmul defiler not punished because a member of the age-grade defiled
60-61: Bateson's Zoological Tripos examination (1926); his attack on the emphasis on homology in zoological theory via a "bluff"
62: Bateson's reading of Doughty's *Arabia Deserta*

1942g, "Morale and National Character."

84: interview with German who said that more was expected of boys than of girls when he was growing up

1943c, "Human Dignity and the Varieties of Civilization."

247: Bateson on the English titled aristocracy; "not our sort of people," "special"

1944b, "Psychology—In the War and After (VII): Material on Contemporary Peoples."

309: in parts of Southeastern Europe, visitors who ignore the womenfolk will offend the men, who expect foreigners to treat the women with respect, even though they themselves tend to ignore the women

1946c, "Arts of the South Seas."

119: Bateson's purchase of Iatmul flutes; concerns of Iatmul men about women seeing the flutes and about the flutes not being played

1947b, "Sex and Culture."

656: masturbation of children by adults in Italy and Bali

1949a, "Bali: The Value System of a Steady State."

39-40: masturbation of children by adults in Bali
40: in Bali, suckling another's baby to tease one's own baby
40: quarrels in Bali

44: "Where do you sit?" asked of strangers in Bali to determine caste relations

1950a, "Cultural Ideas about Aging."

49: at a meeting on mental hygiene problems in aging, question raised about our culture's devaluation of age; Wheelwright's comments
49-52: about old men in New Guinea and Bali

1951a, *Communication: The Social Matrix of Psychiatry.*

204-205: "white monkey" washed ashore in Java before the coming of white men, not recognized by the natives as human (from Dr. Stutterheim, Javanese archaeologist)
220: relationship of Jeeves, the elderly butler, and Bertie Wooster, his master, in the Wodehouse stories
222: 'Tweedledum and Tweedledee *agreed* to have a battle"
225: Ruskin's "true" vs. "false" grotesque
225-226: "Our Father Who Art in Heaven"
233: Balanese word *tis* (feeling of relaxation after sex)
236-237: Bateson's views on the words "British" and "English"
240: Bateson's disorientation (sometimes) when exiting the subway
252: French proverb,
    "You can't make omelettes without breaking eggs."

1951c, Conference remarks.

185: degeneration of native American ideographic script characters
231-232: Collingwood's analysis of T.S. Eliot's "Sweeney Among the Nightingales"

1953a, 'The Position of Humor in Human Communication."

3-4, 8,19: joke about stealing wheelbarrows
9: unsurprising joke
19: courtship of sticklebacks
28: communication with swallows about their conceptual world

1955a, "A Theory of Play and Fantasy: A Report on Theoretical Aspects of The Project for Study of the Role of the Paradoxes of Abstraction in Communication."

40-41: Bateson observing monkeys playing at zoo in San Francisco, January 1952
42: peace ceremony in Andaman Islands (from A. R. Radcliffe-Brown)
47: Blake's "Wise men see outlines and therefore they draw them"

1955b, "How the Deviant Sees His Society."

26: schizophrenic in doubt about the meaning of the message "What can I do for you" from a stranger
26-27, 29-30: psychiatric patient and his mother; "something moved in space," "space is the mother"; "the judge disapproves"; Bateson bringing "both beautiful and untidy" flowers to the fastidious mother
28: cartoon in The New Yorker about native seeking vengeance on woman for wearing exotic pendant

1956a, Autobiographical sketch.

11: Bateson's zoology examination at Cambridge University; his examination of the meaning of "homology"

1956b, 'The Message This Is Play' ." Additional remarks.

77: Bateson's method of feeding two Galapagos albatrosses
149, 230: Bateson's schizophrenic patient playing golf
152-153: Bateson's patient "patrolling the borderline... of sanity and insanity" as an airship
161-162, 164-166, 172-173: Bateson's patient; "mailman," "married a mailbag"; claimed he was an end-table made of manzanita (man's an eater) wood (would); grew beard, which his father said he was "hiding behind"
175-179: otters at zoo in San Francisco
190: Bateson's patient; "you want me to come and live in your world.... I don't like it"
193: Bateson's psychiatry student; "Do you want us to learn what you are telling us? Or is it meant to be a kind of example?"
198: use of metalanguage to change rules of canasta

1956c, "Communication in Occupational Therapy."

188: Bateson's patient's comment that "a contrivance to change the color of a man's eye to please a psychologist is too much"

1956d, 'Toward a Theory of Schizophrenia."

254: Zen training
254-255: employee at home during office hours, put "on the spot"
258-259: schizophrenic patient and his mother; "Don't you love me any more?"
259-261: schizophrenic patient and her family; "Mother had to get married and now I'm here"
262: Milton Erickson and chain smoker
263-264: Frieda Fromm-Reichmann's "therapeutic double bind"

1957a, Remarks.

67: "Tweedle-dum and Tweedle-dee *agreed* to have battle."
127: woman who knew she needed psychiatric help, but was refused (from newspaper)
158: patient who, after discharge from the hospital, camped on the hospital grounds
167: patient who wanted to be rolled up in a wet sheet
184-186: psychiatric admission ward at U.S. Navy hospital, Oakland, California; group therapy sessions observed by Bateson; incidents related to rank

1957b, Conference remarks.

10, 43: John Perceval's voices
44: sensory deprivation experiments
92-93: Bateson's schizophrenic patient; "R-34" blimp and other aliases, including Eunice ("you-ness")
113: Samuel Butler's comment that alcoholism would be a saintly virtue if the headache preceded the intoxication
114: old Buddhist (?) saying that the eye cannot see itself
117: "If thine eye be single, then thy whole body should be filled with light"
118: territory established by mother goat

1958a, *Naven: A Survey of the Problems suggested by a Composite Picture of the Culture of a New Guinea Tribe drawn from Three Points of View,* second edition.

280: Whitehead congratulating Russell, after a lecture by Russell on quantum theory, on "leaving... *unobscured...* the vast darkness of the subject"

1963b, "Exchange of Information about Patterns of Human Behavior."

176: quotes "my friend" Ray Birdwhistell; "Nothing never happens"
178-179: generation of "experimental neurosis"
180-181, 183: quote from P. L. Travers' *Mary Poppins;* in the gingerbread shop owned by Mrs. Corry
181-182: Bavelas experiment giving the illusion of correlation between the subject's button presses and a bell ringing, when in fact there is no correlation (when told the truth, the subjects disbelieve it)

1963d, 'The Role of Somatic Change in Evolution."

532: human acclimation to high altitude
536-537: Waddington's experiments with fruit flies

1964a, "Some Varieties of Pathogenic Organization."

270-271: pricking up of dogs' ears
274-275: cat asking for milk
275-277: generation of "experimental neurosis"
277, 289: Bateson's demonstration of generation of "experimental neurosis" to nurses
277-278: when the therapist was going away for two weeks, his patient said 'That plane is flying awfully slowly"
289: "tip-top" performance of movie star in a "hypersensitive state"

1965, "Communication among the Higher Vertebrates."

21: cat asking for milk
21: porpoise annoyed at its trainer refuses to perform on cue

1966a, "Communication Theories in Relation to the Etiology of the Neuroses."

32: acrobat maintaining his balance
34-35: generation of "experimental neurosis"

1966b, "Problems in Cetacean and Other Mammalian Communication."

570-571: wolf pack in Brookfield Zoo; pack leader treated a transgressing underling as a pup being weaned
571: cat asking for milk
573: silly dog tricks (from Samuel Johnson)

1966c, 'Threads in the Cybernetic Pattern."

3-4: origin myth of "the stone-age people in New Guinea with whom I worked," the philosophy of "some surgeons who have some humility," and Genesis
4-5: Alfred Russel Wallace's letter to Darwin on natural selection
8-9: computer says 'That reminds me of a story"
9-10: need for predators in ecologies
13-14: introduction of metal tools to stone-age cultures

1967a, "Cybernetic Explanation."

29: bread-and-butterflies (from Lewis Carroll)

1968a, 'Redundancy and Coding."

615: kinesic liars
619: how jackdaws indicate to each other that Konrad Lorenz is a "jackdaw-eater"
620: fish mimicry

1968b, "Conscious Purpose Versus Nature."

35: conflict between Romans and Palestinians; St. Paul's boast about being "born free," and his ambition to get on the imperialist side
36-37: Wallace's letter to Darwin on natural selection 44-46: Bateson's myth of the Garden

1970a, "Form, Substance, and Difference."

5: history of Pythagorean inquiry into pattern rather than into substance
8: Jung's "epistemological crisis" resulting in "Seven Sermons to the Dead"
10: blind man with cane
11-12: Bateson's experience, under LSD, of "the disappearance of the division between self and the music to which I was listening"
12: quotes Johann Sebastian Bach; "I play the notes... It is God who makes the music"
12: Ames experiments
12: quotes Blake; "A tear is an intellectual thing"
12: quotes Pascal; "The heart has its *reasons* of which the reason knows nothing"
12: quotes Isadora Duncan (disapprovingly); "If I could say it, I would not have to dance it"

1970b, "On Empty-Headedness Among Biologists and State Boards of Education."

819: William Bateson read Bible passages at breakfast, "lest we grow up to be *empty-headed* atheists"
819: Iatmul myth of creation
819: Philip Henry Gosse's reconciliation of creation and evidence of evolution

1970d, "The Message of Reinforcement."

67-68: F. Attneave's experiments on color patterns
67, 70: quotes Blake; "Nature has no Outline"
72: quotes schizophrenic patient; "If it's not the way I want it, I'll prove it"

1971a, 'The Cybernetics of 'Self': A Theory of Alcoholism."

6: man felling a tree with an ax
6-7: blindman with a stick
16: change in John Perceval's "voices" from bullying to offering him alternatives

1971b, "Chapter 1: Communication."

2-3: Rainer Maria Rilke's *Sonnets to Orpheus* (II, Sonnet 4)
21: schizophrenic patient who told Bateson he built the Great Wall of China

1971f, "A Systems Approach."

244: man felling a tree with an ax

1971h, "Restructuring the Ecology of a Great City."

3: acrobat balancing on high-wire
3: quotes Japanese Zen master; 'To become accustomed to anything is a terrible thing"

Additional post-symposium section in reprint.
(page numbers for Ballantine Books edition)

504: "God is not mocked" (St. Paul, Galatians)

1972a, *Steps to an Ecology of Mind.*
     (page numbers for Ballantine Books edition)

  155, 338-339: co-evolution of horses and grassy plains
  395: Samuel Butler on the analogy between dreams and
      parthenogenesis frog's egg
  466: "God is not mocked" (St. Paul, Galatians VI)

1972c, "From Versailles to Cybernetics."
     (page numbers for Ballantine Books edition)

  469: 'The fathers have eaten bitter fruit and the children's
      teeth are set on edge"
  469: quotes Joyce; "history is that nightmare from which
      there is no awakening"
  469: 'The sins of the fathers shall be visited on the children
      even to the third and fourth generation of those that
      hate me"
  469, 474: "He who would do good to another must do it in
      Minute Particulars. General Good is the plea of the
      scoundrel, hypocrite, and flatterer"
  470: cat asking for milk
  470-471: house thermostat
  471-472: Treaty of Versailles
  472: house of Atreus in Greek tragedy
  473: taking LSD and knowing it vs. not knowing it
  473: William Bateson's opinion of the Treaty of Versailles
  473-474: Samuel Butler's *Erewhon Revisited;* Mrs. Ydgrun,
      guardian of Erewhonian morals reconstructs history

1972d, "Style, Grace, and Information in Primitive Art."
     (page numbers for Ballantine Books edition)

  128: Aldous Huxley on humanity's quest for *grace;* God
      resembles animals in that He is incapable of internal
      confusion and deceit
  128: Walt Whitman on simplicity of animal communica-
      tion and behavior, lost by humans
  130: quotes Buffon; "The style is the man himself"
  130: lions in Trafalgar Square
  130: prehistoric cave art
  134: Samuel Butler on "habit"
  135: Zen discipline
  135: Ames experiments
  135, 143: Van Gogh's perspective
  135-139: Freudian theory
  137-138: quotes Isadora Duncan; "If I could tell you what
      it meant, there would be no point in dancing it"
      (from Anthony Forge)
  138-139: Pascal's "reasons of the heart"
  141: dogs showing fangs
  141: peace-making ceremonies of Andaman Islanders
  144: prehistoric cave art
  146: use of DDT
  147-151: Balinese painting by Ida Bagus Djati Sura and
      other Batuan painters
  148: American carpenter-architect working "without thinking"
  148: Jackson Pollock's works
  148-149: Balinese carving
  150: Tangaroa figure
  150: quotes poem of Macaulay;
      "Was none who would be foremost..."
  1972e, "The Logical Categories of Learning and Commu-
      nication."
      (page numbers for Ballantine Books edition)
  290: audience watching *Hamlet*
  298: Greek tragedy
  301: magical practitioner doesn't unlearn his magical view
      when the magic doesn't work

303: quotes Blake; "Without Contraries is no progression"
303: Zen candidate's laboring
     "like a mosquito biting on an iron bar"
305: porpoise training
306: quotes Blake's "Auguries of Innocence";
     "To see the World in a Grain of Sand..."

1972f, 'Pathologies of Epistemology."
     (page numbers for Ballantine Books edition)

  479-480: Ames experiments
  486: Goebbels' control of German public opinion

1972g, "Double Bind, 1969."
     (page numbers for Ballantine Books edition)

  275: cat asking for milk
  276-277: porpoise training

1972h, "The Roots of Ecological Crisis."
     (page numbers for Ballantine Books edition)

  489-490: use of DDT

1972i, "Effects of Conscious Purpose on Human Adaptation."
     (page numbers for Ballantine Books edition)

  442: Prohibition and bootleggers
  442-443: limits on population growth
  443: "reflexes" of respiration activated by carbon dioxide
      excess
  443: Alice and the flamingo
  446: Martin Buber's "I-Thou" relationship
  447: Pascals reasons of the heart
  447: quote from Book of Job;
      "Who is this that darkeneth counsel..."

1972j, 'The Science of Mind and Order."
     (page numbers for Ballantine Books edition)

  ix: Bateson on not knowing what he was doing
  xvi-xix: Bateson's attempts to answer questions of his
      psychiatric resident students regarding "What is this
      course all about?"; "do you want us to *learn* what
      you are telling us?"; Bateson's diagram to describe
      "the task of the scientist"
  xx: "dormitive principle"
  xxiii-xxv: quote from Genesis and Iatmul creation myth

1972k, Our *Own Metaphor: A Personal Account of a Conference on
     the Effects of Conscious Purpose on Human Adaptation*

  32-33: quotes Blake on "Body" and "Soul"
  53: on the importance of just a single vertical stroke in
      Arabic script, and analogy to low concentrations of
      pesticides
  124: man falling from top of Empire State Building who
      said, as he passed the second floor, "We're doing all
      right so far!" (from Geoffrey Vickers)
  127: Bateson's schizophrenic patient;
      "If it's not the way I want it, I'll prove it"
  136: shooting a rifle vs. shooting a shotgun
  269: genetic conservation
  273-274: ecology of the downs of England
  293-295: Bateson's "fantasy," under LSD, of Still's Lesion
      as the paradigm for the opposite of "the beautiful"
  297-298: Catholic vs. Protestant views of the sacrament
  309: quotes Samuel Butler: "Not on sad Stygian shore..."

Reflections on
Number and Pattern:
Some Trivial, Most Quadrivial

By Mark Siegeltuch (20 Dongan Pl., New York, NY 10040). Copyright 1992 by Mark Siegeltuch.

In *Mind and Nature,* Bateson remarks on the difference between number and quantity:

> *Numbers* are the product of counting. *Quantities* are the product of measurement. This means that numbers can conceivably be accurate because there is a discontinuity between each integer and the next. Between *two* and *three,* there is a jump. In the case of quantity, there is no such jump; and because jump is missing in the world of quantity, it is impossible for any quantity to be exact. You can have exactly three tomatoes. You can never have exactly three gallons of water. Always quantity is approximate. (1)

Numbers, he argues, are not always the product of counting but may be considered a subset of patterns.

> Indeed, it is the smaller, and therefore commoner, numbers that are often not counted but recognized as patterns at a single glance. Cardplayers do not stop to count the pips in the eight of spades and can even recognize the characteristic patterning of pips up to "ten." (2)

Bateson summarizes thusly: "number is the world of pattern, gestalt, and digital computation; quantity is of the world of analogic and probabilistic computation." (3)

Bateson's connection between number and pattern provides a means of understanding the medieval quadrivium, that curious amalgam of arithmetic, geometry, music, and astronomy which was part of the seven liberal arts (the others were grammar, rhetoric, and logic or dialectic). (Architecture would have been a worthy member of the quadrivium were it not a craft whose "arts and mysteries" were restricted to guild members.) Medieval education might best be described as audio-tactile training. It sought to produce an integrated sensibility through a blending or interpenetration of various sensory experiences. The trivium trained men to speak and gesture, somewhat in the manner of the stage. The quadrivium, though less often studied, preserved the underlying metrical principles of the ancient Greeks, emphasizing harmony as the ordering principle in the cosmos and, by extension, in all human art forms. (4)

The ancient Greeks were particularly interested in two properties of numbers, their representation as geometrical forms and their properties of divisibility.

> The Greeks not only operated with numbers in the geometric manner but went so far as to solve equations involving unknowns by series of geometric constructions. The answer to these constructions were line segments whose lengths were the unknown values. The thoroughness of their conversion to geometry may be judged from the fact that the product of four numbers was unthinkable in classical Greece because there was no geometric figure to represent it in the manner that area and volume represented the product of two and three numbers respectively. Incidentally, we still speak of a number such as 25 as the square of 5 and of 27 as the cube of 3 in conformity with Greek thought. (5)

Because of the Greek preference for geometry, the subject dominated mathematics until the 19th century. Mathematicians have traditionally viewed geometrical solutions to arithmetic problems as clumsy, and the prevalence of Greek thought is considered to have retarded the development of a more abstract mathematics. There is some truth in the assertion, but it might have proved more profitable to ask why such ideas persisted. (Kepler, for all his scientific rigor, was still interested in the harmony of the spheres.) These ideas persisted because the linkage between arithmetic and geometry is the expression of an ancient and heartfelt sensory integration. Bateson points out the usefulness of such sensory redundancy in *Mind and Nature* in the section titled 'The Case of Synonymous Languages" (pp. 82-86). Here, geometry is used to reinforce a theorem from algebra. The general issue of sensory integration is discussed slightly earlier in "The Case of the Hallucinated Dagger" (p. 81). (6)

The tactile basis of mathematics was further insured by the separation of calculation and recordkeeping in ancient and medieval times. Calculation was done through the physical manipulation of objects (stones or beads) and the recording of results using Roman, and later, Arabic numerals. The use of written numbers for calculation *(algorithm)* was met with stiff resistance throughout the Middle Ages and only gained the ascendancy in the Renaissance with the growth of trade and bookkeeping. Even then, only the educated computed this way. The marketplace was left to the abacists for a long time.

William Ivins, in his brilliant little book *Art and Geometry* (Harvard University Press, 1946), outlines the tactile basis of Greek art and geometry. It was this bias toward tactile space which prevented the Greeks from developing a true projective geometry. They represented objects as felt, rather than as seen.

The second concern of Greek mathematicians was with matters of divisibility. Here too, geometric patterns play a part. The interest in the properties of divisibility created an interest in prime numbers (a number not divisible by anything but 1 and itself, e.g., 17) and perfect numbers (a number whose divisors add up to it, e.g., $6 = 2 + 3 + 1$ and $28 = 14 + 7 + 4 + 2 + 1$). The interest in divisibility may have developed from the distribution of land and food among ancient peoples, an important economic matter with social, religious, and cosmic significance. The Greeks inherited geometry (land measurement) from the Egyptians, though the underlying principles of the science are far older, as we shall see shortly. (7)

As readers of Plato or Pythagoras will know, geometry and arithmetic were also connected with *musike,* which included song, dance, recitation, and instrumentation. Greek culture was based on musical training. Harmony within the individual soul would lead to harmony between the citizens of the polis, in conformity with divine law, the source of the same universal harmony which governed the motion of the planets. Thus the Greeks could speak of "irrational" numbers, "amicable" numbers, and "excessive" and "defective" numbers. In an integrated world with fixed methods of operation, both humans and numbers can be "out of order."

As Bateson notes, the "jump" or "interval" between integers is crucial. To see how this works, I will refer to the recently published researches of Carl Schuster, *Social Symbolism in Ancient and Tribal Cultures* (Rock Foundation, 1988), written and edited by Edmund Carpenter. (8)

One of the oldest and most common symbols of the human race is the heavenly ladder. It is found all over the world. In traditional architecture, it supports the roof beams where it represents a path to heaven. As in Jacob's dream, it has steps or rungs which can be climbed by the worthy to enter heaven. Laid flat on the ground it becomes a hopscotch board on which one jumps, rather than climbs to heaven, turns around, and reenters the world by descending. Cosmologically, it is the "axis mundi" or center pole which supports the dome of the universe (conceived in many cultures as a tree, mountain, or beam of light). In microcosmic terms, it is the spine, through

which energy may rise to the skull (the dome of heaven). Most basically, each rung of the ladder represents an ancestor. When I climb the ladder, I go back in time to the origin of the universe, stepping on each ancestor as I go back. The first ancestor (or God if you wish) is to be found in heaven, as the Bible says. So much for the model.

What is to be noted is that the word for ladder in Latin is *scala,* which gives us our English word "scale." First we have a musical scale. Let us make the ladder the neck of a stringed instrument. Here the fingers do the climbing. Each note, or interval, is stepped off, so to speak. Each ancestor speaks as we ascend the scale moving from low sounds (earth) to higher sounds (heaven).

We can lay the axis mundi on the ground and perform a dance using stepping or hopping motions.

A scale is also a unit of measurement. We speak of a scale model. A small wand or stick with notches can be carried by a shaman to represent the axis mundi. It is a miniature heavenly ladder. Similarly, we build our house to scale; that is, we recreate the cosmos in a smaller form.

If the axis mundi represents the spinal column of the original ancestor, it can be laid flat and subdivided. This can be the basis for town planning. Each clan or group is assigned to a "quarter." The community is now part of the corporate body (the body of Christ). In fact, many ancient cities were planned this way. The fields were measured by being stepped off.

Not to belabor the point, the union of arithmetic, geometry, music, astronomy, and architecture is very old (paleolithic). I cannot possibly provide all of the documentation here, but it exists. What was counted first was ancestors, generally through the use of notched sticks. These sticks, or staffs, were miniature heavenly ladders. Out of a few simple ideas, integrated in a wide variety of media and art forms, grew the foundations of neolithic culture and, much later, classical culture, bequeathed to the Middle Ages.

Footnotes

1. Gregory Bateson, *Mind and Nature,* Bantam, 1979, pp. 53-54.

2. Ibid., p. 54.

3. Ibid., p. 54.

4. Frederick Macody Lund wrote in *Ad Quadratum* (Batsford, London, 1921): "... medieval church architecture is a direct continuation of the art of building classical temples, which in its turn expresses the perception of Greek philosophy concerning the harmony of the universe." The method was simple but allowed for complex variations. It was based on the division of horizontal and vertical space into squares and subsequently into rectangles—allowing the construction of "golden sections" (angles of approximately 63 degrees).

5. Morris Kline, *Mathematics In Western Culture,* Oxford, 1953, pp. 37-38.

6. While Bateson's concern is with what he calls "deuterolearning," it is really a call for us to "come to our senses," that is, for us to reconsider how we make sense of the world. History, I have found, offers us the same challenge.

7. See Karl Polanyi's *The Livelihood of* Man (edited by Harry Pearson), Academic Press, 1977. Polanyi worked out a theory to explain the economic structures of tribal and archaic societies which was free from 19th century economic assumptions. He used the terms "redistribution" (modern taxation is one form) and "reciprocity" (gift exchange) to identify two of the most important economic and social structures. Redistributive economies move goods from the margins to the center where they are redistributed in the form of services

or subsidies. Reciprocal economies use a balanced exchange of goods between different social groups, often organized symmetrically.

8. Carl Schuster (1904-1969) was known internationally as a pioneer in the study of folklore and traditional symbolism. He died before he had a chance to publish the results of his extensive research.

Some Thoughts on Mary Catherine Bateson's *Composing a Life*

By Rhoda R. Gilman (510 Michigan St., St. Paul, MN 55102). Copyright 1992 by Rhoda R. Gilman.

Several people have told me that they find this book puzzling and unsatisfying. Perhaps that is because its structure and format reflect all too faithfully the underlying theme of its argument. That theme is the fact of discontinuity in the lives of women and how they cope with it creatively. Although the work purports to be a comparative biography of five women, it holds no connected account of their lives and personalities. Those looking for linear narrative and curious about the individuals and their fates will inevitably be disappointed. Like her father, Bateson tends to see patterns and point them out, letting the reader carry on from there.

The women in question, one of whom is Bateson herself, are all people who might well deserve conventional biographies. They are highly educated and creative, and, against heavy odds, they have achieved leadership in a variety of fields. All are Americans; one is an immigrant from eastern Europe, and one (Johnnetta Cole, president of Spelman College) is black. All are friends of Bateson, and the material on them is personal and anecdotal.

Bateson weaves their experiences in and out through a series of brief essays on the lives of women in American society. The book's weakness as history and biography is that these experiences in their own right seem to lead nowhere. They are used mainly as illustrations for the author's arguments. But it is unfair to judge as history and biography a work that is really a series of astute cultural and anthropological reflections.

The first chapter is for me reminiscent of Bateson's talk at the annual history conference of the Minnesota Historical Society in 1982. At that time, she was pondering the social and personal implications of our extended lifespan. She saw it associated with the tendency to live two or more consecutive and discontinuous lives as exemplified in broken marriages, new careers, and second families.

Today she feels that "Our lives not only take new directions; they are subject to repeated redirection.... The landscape through which we move is in constant flux.... Just as it is less and less possible to replicate the career of a parent, so it will become less and less possible to go on doing the same thing through a lifetime." She then asks "whether indeed the model of improvisation might prove more creative and appropriate to the twentieth century than the model of single-track ambition."

Improvisation to meet abruptly changing situations is now demanded of both men and women. It has always, she points out, been the dominant pattern of women's lives. Few women have ever been privileged to follow a consistent goal through years shaped by their own physiological changes and by the needs of others, whether parents, spouses, or children. She argues that the sense of failure and frustration that has often dogged them ought to be countered by placing a higher value on their ability to improvise.

In the succeeding chapters, she takes up a number of issues and attitudes, examining how these have played out in the lives of her five subjects and, in turn, the implications they hold for the larger society and its survival. One such issue is openness to difference—the willingness to accept and see the strengths in alternative cultures. This, she suggests, is a necessity for success in today's world, both personally and as a nation. Yet she cautions that more is required than simple adaptation: "Composing a life involves an openness to possibilities and the capacity to put them together in a way that is structurally sound," for "even crazy quilts are sewn against a backing."

Another issue is the value of complementarity. She points out that American social ethics are based on a model of evenhanded competition that presupposes similar—or symmetrical—parts. Yet the natural relationship between men and women is profoundly asymmetrical. It is one of difference, interdependence, and complementarity. To the extent that we translate this both in practice and perception as inequality, we miss the benefits to be gained from differences that support each other.

Here I wish that Bateson had probed further. Complementary strengths have little value unless they are focused on a shared goal—in the case of gender relationships, the building of family, clan, or community. Interdependence is not an end in itself, but a means to an end. Is not the American model of symmetry rooted in our intense commitment to individualism? We idealize individual uniqueness and self-fulfillment, yet as the goal of working together to build community has faded before the concept of a society based on individual competition, the value to be derived from differences has also tended to fade.

The tone of the book is thoughtful and understated except for a note of pain and betrayed trust that comes through when Bateson refers to her own shattering encounter with sexism at Amherst College. As the daughter of Margaret Mead, whose towering stature was consistently ignored by the institutions she worked for, one would have thought Bateson would have been prepared for this. Yet it appears to have been unexpected. Perhaps Bateson's years of teaching in Iran had led her to idealize American academic life by contrast.

For those familiar with the work of Gregory Bateson, there are echoes in this book of the conferences on conscious purpose and human adaptation sponsored in the 1960s by the WennerGren Foundation—conferences in which Mary Catherine herself was closely involved. She never uses the term "ecofeminism," but in my own reading of her quiet reflections, there is a clear message: We are at a point in human destiny where survival of the species no longer calls for heroic holding fast and battling to achieve a predetermined objective. Instead, we need a willingness to let go of pride and purpose and to learn from the biosphere that cradles us. For such a strategy, the culture of women is far better adapted than that of men. Bateson does not say this bluntly, but it is the clear implication behind her insistence that accommodation and successful improvisation have become the true measures of achievement.

Differences Which Might Make a Difference to You

"Observer: Steps to an Ecology of Mind," a poem by Robert Hopper, appeared on pages 267-268 of *Communication Theory 1(3),* August 1991.

Cambridge University Press and Editions de la Maison des Sciences de l'Homme published *The Individual, Communication, and Society: Essays in Memory of Gregory Bateson* in 1989. This 343-page book was edited by Robert W. Rieber, professor of psychology at John Jay College of Criminal Justice, City University of New York, the Graduate Center (New York City).

A Bateson study group, "LaB/Laboratorio Bateson," has been organized in Italy by Sergio Manghi and his colleagues. Manghi is working on a journal titled *Oikos,* "with a strong batesonian' perspective." For details, write to him at the Istituto di Sociologia, Universita di Parma, Borgo Carissimi 10, 43100 Parma, ITALY.

In the fall of 1992, Peter Lang Publishing (62 W. 45th St., New York, NY 10036) plans to publish *Video Mind, Earth Mind: Collected Writings of Paul Ryan, 1968-1991.*

The Beauty of Social Organization, by Rafael Ramirez, is now available from ACCEDO, Gnessener Str. 1, D-8000 Munich 81, GERMANY.

One Last Bateson Quotation

I think that cybernetics is the biggest bite out of the fruit of the Tree of Knowledge that mankind has taken in the last 2000 years. But most of such bites out of the apple have proved to be rather indigestible—usually for cybernetic reasons.

Cybernetics has integrity within itself, to help us to not be seduced by it into more lunacy, but we cannot trust it *to keep us from sin.*

—From Versailles to Cybernetics (1966)

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