Avoiding Bremermann's Limit
by Roger Conant

Ashby mentioned Bremermann’s Limit often in his papers and many people have the impression that he used it as a sort of impossibility proof to show that certain questions of a combinatorial nature could not be answered. If you are interested, write me and I will send you a note indicating that Bremermann’s Limit can be avoided, at least some of the time, so that it should not be used too quickly to establish the impossibility of things that are in fact possible.

Cybernetics in Argentina

We have received a report listing the activities of the Argentine Scientific Society, Institute for Cybernetics. The Instituto de Cibernetica was quite active in 1980. The Institute publishes twice a year a journal (the REVISTA). There are two groups within the Instituto – the Group of Quantitative Cybernetics and the Study Group of Integrated Systems. Each group organized an impressive list of seminars during the year. The GESI organized visits by van Gigch and Vendres, each of whom conducted seminars during their visits. The GESI also organized two courses in Cybernetics and Systems and published two "Cuadernos" of articles and papers. If you would like further details write me (R.C.) for the full report.

6th European Meeting on Cyb & S.R.

from Robert Trapp!

The Sixth European Meeting on Cybernetics and Systems Research will be held April 12-15, 1982, at the University of Vienna, Austria, organized by the Austrian Society for Cybernetic Studies. There will be plenary lectures and symposia on general systems methodology, mathematical systems theory, cybernetics in biology and medicine, cybernetics in cognition and learning, structure and dynamics of socio-economic systems, cybernetics in organizational control, engineering systems methodology, fuzzy sets (meeting of the EURO working group), health care systems, semiotic systems, artificial intelligence, systems research on science and technology, and cybernetics and philosophy.

For the preliminary program and the call for papers, please contact the chairman, Prof. Robert Trapp, Dept. of Medical Cybernetics, University of Vienna, Freyung 6/2, A-1010 Vienna, Austria.

Global 2000 Report

A summary of the Global 2000 report mentioned in an earlier newsletter may be obtained from Charles Osolin, Council on Environmental Quality, 722 Jackson Place, N.W., Washington DC 20006. Ask for the press release of 7/24/80. In a pinch you can also get it from me (R.C.)
NEWBOOKNEWBOOKNEW

by Barry Clemson

Former ASC President Mark Ozer has edited a book which is now available:

A CYBERNETIC APPROACH TO THE ASSESSMENT OF CHILDREN: TOWARD A MORE HUMANE USE OF HUMAN BEINGS

This collection addresses the application of cybernetics to the assessment of function in children. The authors suggest that cybernetics leads to new ways of thinking about both the process of gathering data and the type of data sought. They apply a new paradigm that may lead to greater recognition of the inherent individuality of human beings and provide the scientific basis of a more humane approach to assessment.

In his private practice Dr. Ozer treats children with developmental problems and a wide range of neurological diseases.


5500 Central Avenue Boulder, CO 80301

JOBS LOOKING FOR PEOPLE

From time to time we receive announcements about job openings. Rather than reproduce the entire announcements it seems best to simply mention the institution and the job title. If you are interested then please write me (R.C.) and I will send the details.

Annenberg School of Communication, Univ. of S. Cal.: one in Communications Technology, one in Mass Communications, one in Telecommunications Policy, all full time faculty positions.

Wharton School of the Univ. of Pennsylvania: faculty openings in the graduate program in social systems sciences.

LOW RESPONSE TO REQUEST FOR NAMES

by Stuart Umpleby

In Newsletter 4 Roger and I asked for the names and addresses of friends of yours who might like to become members of the Society. We also offered to send brochures that you could pass out to people in person.

So far we have received one name and address from one person and ten names and addresses from a second person. No one has requested copies of the brochure. This is a start, but it is not as large a response as we had hoped. This low response suggests why the direct mail business has grown so rapidly in the last 10 or 15 years. That is, direct mail may be a better way to build membership than relying on current members to act as recruiters.

This note is included here so that we can learn from our experiences. Names and addresses of potential members and requests for brochures are still quite welcome.
Doreen and Leo Steg have returned from China where they reported on cybernetics research and activities in the U.S. They were the guests of the Chinese government.

Klaus Krippendorff has returned to Philadelphia after one year at the Netherlands Institute for Advanced Study in the Humanities and Social Sciences.

Howard Hilton has been traveling in Europe and Canada where he is encountering increased interest in the Hilton Universal Code (HUC), a method of indexing and retrieving information that could be used on any database management system or home information utility. He reports that people are beginning to understand the question to which he developed an answer about 10 years ago.

Heinz Von Foerster was in Lisbon, Portugal, recently for a conference celebrating the work of Jean Piaget. Ivan Illich was there as well.

Dan Howland is encountering a surge of interest in cybernetics both among his students at Ohio State and among research sponsors at Wright Patterson Air Force Base.

If you are interested in proofs in N-dimensional information theory, of the type that Ashby promoted, write me for a note indicating how these proofs can be carried out very efficiently.
A MAGICAL MYSTERY TOUR

Dateline: Toronto, Montreal, Orono
Jan. 6 - 15
Barry Clemson

A group of cyberneticians have just completed a trip that combined many of the characteristics of a scholarly conference, a rollicking party, and an extended story telling session with the village elders. This trip, which we began to refer to as "a Journey to the East" and as the "magical mystery tour" began in Toronto with the SGSR Conference. At the end of the conference, we spent all day Saturday in a workshop that Bill Reckmeyer arranged and finished there just in time to catch a train to Montreal Saturday night. Sunday and Monday morning were spent in a seminar (with about 100 observers, no less!). Monday afternoon we flew to Orono, Maine for a talk by Heinz von Foerster, and two days of seminars with von Foerster and Stafford Beer on self-organizing systems.

The SGSR Conference in Toronto included numerous sessions arranged by ASC, including several that were unusual in their format. Stuart Umpleby led an all day workshop that focused on the role of science in society. This provided an opportunity for a group of us to go into some depth in trying to pull together our thinking, and as a bonus, was quite a lot of fun. This workshop was part of an ongoing project of Stu's, so you might be alert for the chance to participate in one of his workshops at some future conference. For me, one of the most noteworthy happenings of the Toronto meeting was one of those serendipitous events: several of us spent a lengthy evening that began with a lament about how stuffy presidential banquets always are and went on to an uproarious session of fantasizing about what we should do to make the meetings less stuffy, more interesting, and higher quality. Our outrageous "plans" included the following (some of which we are serious about!).

1. every paper session needs a mime whose job is to reflect the level of excitement in the room. If a particular presentation is terribly dull, the mime would naturally fall asleep, probably right in front of the speaker (this mime should be known as the "cybernetic monitor").

2. a large oval mirror should be carried around so people can see themselves in it. Printed across the top of the mirror, in small letters, will be "do you see a pedant?"

3. presidential banquets should become occasions for art, not intellectualizing. This might be accomplished in several ways. We might produce a play or series of skits on the history of the systems sciences. Or, we might just have an "open mike," so that anyone could tell a story about our history. The founding fathers (and mothers!) of cybernetics and systems theory were extremely colorful people and their lives provide an incredibly rich source of interesting anecdotes. This history is something we should cherish and pass on.

Saturday of the magical mystery tour was spent in Reckmeyer's workshop. This session, which went all day, involved 30 of us grappling with the role of GST in achieving the sort of future that we choose, rather than waiting for the future to happen to us. We worked most of the day in groups of about six and spent the latter part of the day sharing the results. The group was extremely diverse, with systems theorists of many different varieties. For me at least, the result was extremely rich and valuable--I came
away with a huge treasure trove of exciting ideas. One of the strong themes throughout the day was a process of self-examination, a process of asking to what extent we ourselves were part of the problem and to what extent we might be able to really help. To paraphrase Pogo "we have met the enemy and he is us."

Saturday evening a group of twelve of us boarded the train for Montreal. Our group, which included Heinz von Foerster, Stafford Beer, Gordon Pask, Paul Henshaw, Bill Reckmeyer, David Mitchell (our intrepid host for the Montreal session) and six other equally weird folks, had the car to ourselves except for a few skiers who clearly thought they were in dangerous company. Since our first class tickets included food and drinks, a party immediately started. Personally, having a delicate constitution that was at that point radically overstimulated with the week's activities, I retreated into a corner with a science fiction book and growled "go away" at everyone who dared talk to me. By the time I finished the book, the party was in full swing and I was ready (I thought) to deal with people again. I didn't reckon on Gordon Pask. Before I knew quite what was happening, I was participating in a session in which very distinguished scientists were having their pictures taken with cigarettes in their ears. So much for the dignity of cyberneticians!

Sunday was devoted to a seminar on education, hosted and paid for by David Mitchell and Concordia University. Fifteen of us sat around a big u-shaped table in front of an auditorium filled with observers. Sunday was devoted to relatively unstructured discussion, beginning with the question of what GST had to say about education. Monday got very practical and intense when one of the audience tossed us a real situation in which an Indian tribe is trying to restructure their educational system. Apparently the audience found the discussion as fascinating as I, because no one left.

Sunday evening we (the 15 seminar participants and about 20 of the observers) found ourselves seated around an enormous square table at a semi-formal banquet. As luck would have it, Bill Reckmeyer and I were directly opposite each other. Halfway through the second course, we looked at each other and simultaneously said, "Aha! Let's do it!" Immediately upon finishing dessert, we implemented our scheme. Bill popped up with two sentences of context, I popped up with a short anecdote, each repeated once, and although we had planned two more iterations, a Russian cybernetician stood up with a story. The next two hours were filled with tales of Norbert Wiener, Ross Ashby, Margaret Mead, Gregory Bateson, Warren McCulloch and others of the founding fathers, including several of those present at the banquet. Eventually, Bill and I decided that everyone (especially us!) was exhausted and we had to end. We couldn't stop it--the storytelling went on until people just got up and wandered away out of sheer exhaustion.

Monday at noon six of us left Montreal by air for the sessions at Orono, Maine where we were joined by several others from the Toronto meeting and additional cyberneticians from Maine and several other states. The sessions in Maine were financed by the University under the rubric of the Socratic Symposia and one of our pleasant surprises was that the President of the University and his wife
A MAGICAL MYSTERY TOUR (Cont.)

(Paul and Nancy Silverman) participated in some of the sessions. The Symposium began with a brilliant two hour lecture by Heinz von Foerster, called "Cybernetics: The parable of the parable of the cave." The following two and a half days were devoted to long intense sessions of discussions that began with the topic of self-organizing systems and branched out from there to include a wide range of particular types of systems. Finally, on Thursday, the magical mystery tour ended and everyone flew off to their respective homes and work places.

SHORT COURSES AND CONFERENCES

We often receive notices of short courses and conferences. We will hereby begin announcing these in the newsletter if they are brought to our attention by readers. However we will print here only the barest skeleton of information about them. As long as it does not become an unreasonable burden I will be willing to forward to you a copy of the full announcement if requested.


7th int’l conf on very large data bases, Cannes, France, 9/9-11/81.

A New Cybernetic Association
Barry Clemson

Report of a new association and a conference reached me recently.

1st International Symposium on Cybernetics and Technology
1-5 April, 1981
Palais des Congres
Batousson (Cameroon)

The International Association for Cybernetics Engineering, formed in 1978, has as its primary objective helping "...the developing countries in their efforts in self-paced acquisition of modern technology needs." The symposium (noted above) has an International Program Advisors Committee that is truly impressive in terms of the stature of members and in terms of the number of countries represented.

"The main purpose of this congress is to give some possibilities to researchers, professors and technicians and other lecturers from the developing countries to meet together with their colleagues from developed countries. Another ‘raison d’etre’ is to help most peoples from the developing world to raise their scientific and technological potential and to improve the quality of the best international cooperation and understanding." (quoted from their letter).

Interested persons should contact Emmanuel Fotso Kings, Chairman, International Association for Cybernetics Engineering, 40, rue de la Montagne-Stenevieve, 75005, Paris, France.
Keeping Up -- The Cybernetician's Trap

Editorial: Barry Clemson

Cyberneticians have a particularly fearful problem in "keeping up with the literature." A good scientist must be on top of the relevant literature and that means "familiar" with the latest stuff. As a graduate student in political science it was clear to all that anyone who failed to read the New York Times daily was both an intellectual and a moral failure! Given the explosion of knowledge, there is only one solution to this problem as it is currently formulated: one must define the area of study very narrowly. For the cybernetician there is no escape: one must keep up with the literature (otherwise one is professionally incompetent) and one must read widely (otherwise one is no good as a cybernetician).

One of the manifestations of this trap is that most social scientists today are "familiar with" systems theory. In reality what this means is that every self-respecting social scientist has browsed through a few books on systems theory. In so doing the social scientist picks up a few of the ideas (e.g. feedback) which they then pervert because they haven't given the topic sufficient study to notice that we are proposing a serious paradigm shift. For instance, the editor of a very prestigious journal once told me that he knew of about ten social science dissertations based on systems theory and that all of them were failures. Of course they were failures; that is what you would expect if you take one notion from GST and cram it into the paradigm of reductionism. As a second example, examine in any of the social sciences the various textbooks that have some variant of "a systems approach" as a subtitle: nine out of ten times you will find some of the jargon, an attempt to be comprehensive, and that the reductionist paradigm is still there intact.

Ok. I rest my case. I submit the evidence is overwhelming that very few of us (probably none) are able to keep up with the literature and be cyberneticians. The only possibility then is to escape the trap, in Beer's terms to operate meta-systemically.

To operate meta-systemically is to invent a new language for discussing the problem. The old language says "keep up with the literature in your field". My proposed new language says "choose reading material to maximize the change in yourself." The old language provides a recipe for stagnation (after all, for the social sciences most journal articles are full of pap that we already knew because we have been reading the stuff for years). The new language provides a recipe for adaptation. An economist would say the new language operates to maximize the marginal utility of the reading -- and I guess this provides some respectability to the notion. The new language also makes it possible to read as a cybernetician (as compared to a disciplinarian) without feeling immoral!

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LECTURERS NEEDED

Professor J.L. Elokim who is hosting the Fifth International Congress on Cybernetics and Systems in Mexico City, 17-22 August 1981, is planning on having a two week tutorial workshop prior to the conference. He needs instructors to teach during this two week session which will be attended by about fifty students. Each lecturer would have his expenses paid to Mexico City and in Mexico City but there would be no honorarium. Each lecturer would teach 20 hours. The workshop would meet for 3 hours in the morning and 3 hours in the afternoon. He would like to have three lecturers. If you would like to apply for one of these positions, write to Dr. Elokim right away at Asociacion Mexicana de Sistemas Y Cibernetica Calle de Antonio Sola No. 43 Col. Condesa Mexico 11, D.F. Mexico
LAWS OF INFORMATION

dateline: Toronto, Jan. 8, 1981
Barry Clemson

Stuart Umpleby and Roger Conant did a tutorial session on information theory which demonstrated that I still have a lot to learn (and made me suspect that some of you might also!). Without trying to summarize the whole tutorial, there are two aspects that I can report on:

There are various strategies for regulation:
1. the regulator matches the disturbances on a one to one basis, e.g. an athletic contest.
2. the regulator matches the disturbances on a one to many basis, e.g. the police relative to potential criminal acts.
3. ecosystemic changes: in cases where the strategies above fail, the rules of the game might be changed to permit success.
4. epistemological changes: in cases where all else fails, one might redefine the game, e.g. decriminalization of a certain drug.

There are clearly different advantages and costs associated with each of these strategies.

There seem to be five distinct laws of information:
1. information is measurable and finite.
2. the law of requisite variety (Ashby's law).
3. every good regulator must be a model of the system regulated (Conant-Ashby law).
4. two models of the same thing generate instant humility. The force of this law is more or less inversely proportional to the number of variables shared by the two models.
5. the partition law of information rates. This law says that the information processed by a system is partitioned additively among the following functions: throughput, internal coordination, blockage (i.e. deciding whether some element is relevant or is garbage and should be thrown away), and noise or creativity. The significance of the law is that there is a zero sum trade off among these four kinds of information.

Those of you who would like further information might contact Roger Conant (Information Engineering, University of Illinois at Chicago Circle) or Stuart Umpleby (Management Science, George Washington University, Washington, DC).

TO STUDENTS WITH GENERAL SYSTEMS PERSPECTIVE

from Michael Stack

The students in the Cybernetic Systems Program at San Jose State University are presently organizing a study group to actively participate in the process of general systems education at San Jose State, and to inform each other of individual curiosities in the field. We are interested in generating an international group - a communicational network among students to facilitate contact with others having similar interests. We think such a student organization is needed, and this will take a cooperative effort at the individual level to build this kind of commitment to general systems education. For more information, interested persons are urged to contact: Michael E. Stack, Cybernetic Systems Program, San Jose State University, San Jose, California 95192.
THE ASHBY AND VON FOERSTER BOOKS

from Roger Conant

One of the concrete goals set at the ASC conference last April was to bring out books on the "Old Masters" of cybernetics, specifically Ross Ashby and Heinz von Foerster. Both of these books have now been put together and are ready for printing. Here are the titles and abstracts, from a brochure of the publisher:

MECHANISMS OF INTELLIGENCE: Ashby's Writings on Cybernetics. by Roger Conant.

W. Ross Ashby (1903-1972) was one of the earliest and most influential pioneers in the field of Cybernetics, coming to it from training in psychiatry and an intense interest in the mechanistic processes which underlie intelligence and adaptation. His two books, Introduction to Cybernetics and Design for a Brain, are classics which have won worldwide acclaim. His other writings are scattered in various journals, books, encyclopedias, letters to the editor, and unpublished works handed out as classroom notes during his teaching career. This book presents his key publications on ideas not included in his two earlier books, as well as some classroom materials in the informal and witty style which so endeared him to those who knew him personally.

Ashby's work cannot be neatly divided into exclusive categories; the topics in the book overlap considerably but include the following: (1) self-organization, adaptation, and the development of stability; (2) regulation and control, and their relation to information; (3) information theory generalized to many dimensions, especially as applied to the dynamics of large and complex systems; (4) informational limits and impossibilities; (5) the analysis of constraints in many-dimensional systems; and (6) intelligence, creativity, and genius.

OBSERVING SYSTEMS. by Heinz Von Foerster.

It is left to the reader to decide for himself whether this kaleidoscope of papers is about systems that observe, or about how to observe systems (including systems that observe, for instance, the observant reader).

Memory, reality, cognition, object, computation, ethology, self-organization, perception, neural nets, recursive functions, responsibility, Maxwell's demons, etc., are some of the polychromatic conceptual bits of which the patterns of this kaleidoscope are formed. The driving force that generates these patterns is toward a theory of knowledge - or better, of knowledge acquisition - in which the act of observation is seen as that of a creation; Let there be vision - and there was light!

Part I of this collection of sixteen articles consists of six theoretical papers concerned with semantic clarification and developments of rigorous formalisms to clear the way for a foundation of an epistemology of observing, i.e., one that can observe (construct) itself. This epistemology is then approached in the seven papers of Part II. Part III uses in three book reviews this position as a mirror to reflect upon reflections made by others.

ASIS CONFERENCE

The 1981 Annual Meeting of the American Society for Information Science (ASIS) will be held in Washington DC, October 25-30, 1981 (convenient to the time of the ASC conference, October 31 - November 2, also in WDC.) The theme is: The Information Community: an Alliance for Progress. Unfortunately the deadline for stating your intent to contribute a paper has passed. However unreviewed "Idea Exchanges" might still be accepted. Details can be obtained by writing me (RC).
A few weeks ago I published an article in the Newsletter (Number 5, November 7, 1980) about what I call Ashby's cybernetics or the discipline of cybernetics. In it I attempted to differentiate this almost unknown form of cybernetics from the many other subjects with the same "cybernetics" label. In addition, I attempted to point out that the discipline provides some exciting benefits which manifest themselves in two ways: directly by the simplification of complex situations so that they become understandable and manageable, and indirectly as a discipline opening the door to the development of new empirical sciences.

I received a number of letters commenting on that article, and it seems appropriate to give a response through the Newsletter.

William Beaver is involved in finding ways to relieve unnecessary and nonproductive stress, and feels his field needs a methodological breakthrough. He expressed particular interest in my statement of possibilities of "the development of an empirical science dealing with the changing of behavior through interpersonal communication" and asked if there were any articles on the subject.

To my knowledge there is nothing published about any aspect of Ashby's cybernetics per se. Although there are a number of publications written by people who have read Ashby they tend to be merely cybernetic classifications of selected complex phenomena. They do not address the process of learning and applying the discipline. Although I received several letters indicating fairly solid understanding of these concepts my evidence is that the number of people who have a working familiarity with Ashby's discipline is very small. This means that, at this time, the only way to learn, or evaluate, the discipline is to read Ashby's Introduction to Cybernetics, and, importantly as you go along, work through the examples. The lack of publications is not a serious problem for Ashby's book is extraordinarily well written. Reading it will be a remarkable learning experience.

Ashby's cybernetics should impact William Beaver's efforts in four ways:

1. The objective "relieving unnecessary stress" should be restated in the language of the discipline. (not a trivial task). Doing so will help in several ways:

   - It will minimize the ever present risk of going after nonsense or partly empty objectives such as the medieval search for the universal solvent. The re-expression also helps to make the objective more actionable, easier to observe.

   - This re-expression presents the objective to the mind in its broadest possible manner. This breadth can significantly help in mentally triggering new ways of attaining that objective. It helps creativity.

   - Because the concept of models (called homomorphisms or isomorphisms) is interwoven into Ashby's cybernetics, the discipline helps in inventing practical ways to objectively measure progress. In my experience this has been one of the most important benefits from the translation.

2. A strong effort should be made to understand the individual patient's "stress" mechanism in Ashby's
language. Doing so will help identify the cause behind the cause and aid in correcting the "fundamental" problem.

3. The methodology of assessing "unnecessary stress" can also be an important function of Ashby's cybernetics. The usual: translate the diagnosis process into the language and the result should be a better understanding of the process of determining the state of stress. (See comments below on Mark Ozer's use of cybernetics to analyze the medical diagnosis process.)

4. Since the above functions help define and clarify what is to be changed they are generally prerequisites for use of the yet-to-be-developed science of interpersonal communication. Even though the science is in the conceptual stage there is reason to believe that some of the principles could be quickly developed and helpful in William Beaver's work. One should be reminded that changing behavior has always been a significant function of interpersonal communication and that what is new here is a discipline which makes the science of communication feasible and which will hopefully make the generalities relating to interpersonal communication less ambiguous and the effects clearer. Ashby has taken a number of terms from information theory and through his development process broadened their meaning so they are applicable to far more than telephone communications. The words: variety, constraint, noise, interference, decoding, redundancy, to name a few, are descriptive of the physical aspect of communications and therefore, it would appear, will become a new basis for empirically established communication generalities. Some examples of the areas that these generalities might address:

- It is possible and common to transmit several messages at the same time through a single interpersonal communications channel. Secondary messages such as facial expressions or enthusiasm can support or refute the primary verbal message. The dominant message will usually be the one with the greater variety. For example, the spiel of a used car dealer is predictable; it contains little variety. His secondary messages, such as his reaction to the discovery of defects in the automobile, are likely to provide more information and have a bigger effect on the buyer. They have more variety.

- An important technique in which behavior can be changed through communication is through the selection and transmission of constraints useful to the changee. The discipline provides little help for simple constraints. The problem lies in communicating constraints which are more complicated and difficult to establish. The "cause" behind "unnecessary stress" is likely to be in that category. In these complex cases structuring the message generally around what Ashby calls Black Box analysis (the scientific methodology in a complex environment) creates believability. And believability is necessary for change.

Mark Ozer sent a paper which pointed out that in a physician-patient relationship the information generated by one is not independent of that generated by the other, and that this interdependence adversely affects
the diagnosis. Mark refers to this interdependence as "mutual causality". To improve the situation the questions in a physician's diagnosis were restructured so that the patient played a larger and more independent part in the determination of the problem and in the selection and implementation of the cure. Several points about this approach:

Although Mark does not appear to be using Ashby's cybernetics, the type of benefits he obtained from the translation of a medical situation into cybernetics is similar and illustrative of those I have obtained in the business world with Ashby.

If Mark's analysis had been generated from a knowledge of Ashby's language I believe there would have been several differences. The emphasis would have been on the creation of information from goal oriented rather than process oriented behavior. In the analysis the emphasis would not have been on "mutual causality" or feedback. The advantage of the Ashby approach is that it appears more closely related to the final results that were obtained and therefore would be of greater aid in implementing the new approach.

There are many situations in the medical field which could be helped by analysis with Ashby's cybernetics. Individually they might not be potentially as general and far reaching as the work done by Mark but, in total, because of their higher frequency, they would have a bigger effect. The implication of this, however, is a necessity for broader education in the discipline.

Several of the letters expressed reservations over the use of the term "discipline" in relationship to cybernetics. If one will allow "discipline" to be defined as a logically consistent set of concepts which do not need empirical verification to determine their truth, then Ashby's cybernetics, along with algebra and geometry, would be clearly classified as a discipline. On the other hand, many of the other forms of cybernetics, as I know them, would better come under the label of a descriptive or vocabulary building science, or perhaps a philosophy. Under the above definition they are not disciplines.

Finally a point that appears not to have been clear in the earlier synopsis. Ashby has taken a set of words, few of which are unfamiliar, and through his development process broadened their meanings so that their definitions reach into the sciences, the arts, the languages, in fact almost all human activity. It is done in a manner so that the words do not lose their precision and concreteness. It is this vocabulary with its unusual and useful attributes that distinguishes his work.

I want to repeat my request for comments, particularly in reference to the possibility of new empirical sciences. The address: Bruce Abele, 23 Russell Court, Newtonville, MA 02160.