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What the world needs now is just one more learned journal. It should be stodgy, recondite, arrogant and humorless. Above all, its reasoning, preferably couched in arcane mathematical notation, should be subtly trivial or inconclusive. The persistent general reader’s reward at the end of most articles should be an urge to yawn, or a quickly suppressed anxiety fit about the adequacy of his (or her) intelligence and education. Each author should find the articles preceding and following his own either irrelevant or incomprehensible, except that a few contributors should find here a comfortable place to rattle academic credentials at a very few others. The outward and inward aspects of this journal, if it is to command a respected place in the vast morass of professional literature, must be formal and forbidding to invoke suitable feelings of awe and credulity.

It is in the shadow of this specter that the FORUM, this Summer, has been transmogrified from a merely chatty newsletter for a rather small society into a—yes!—journal. This quarterly, in the words of Roy Herrmann, “. . . will become the arena for spiritual fights to clarify complex issues in a way that makes it dynamic, instructive and good reading material.”

The “complex issues” are those of Cybernetics and of the world. The “spiritual fights” are likely to be over what Cybernetics is and may become. Shall we look, in the FORUM, to define Cybernetics by what cyberneticians do? Will non-technical English suffice to express and dispute the polyglot philosophic and scientific beliefs, concepts, techniques and actions which are uniquely Cybernetics? Are we embarking on an Old Testament journey?

And the whole earth was of one language, and of one speech. And it came to pass, as they journeyed from the east, that they found a plain in the land of Shinar; and they dwelt there. And they said to one another:

“Go to, let us make brick, and burn them thoroughly.”

And they had brick for stone, and slime they had for mortar. And they said, “Go to, let us build us a city and a tower, whose top may reach into heaven; and let us make us a name, lest we be scattered abroad upon the face of the whole earth.”

And the Lord came down to see the city and the tower, which the children of men builded. And the Lord said, “Behold, the people is one, and they have all one language; and this they begin to do: and now nothing will be restrained from them, which they have imagined to do. Go to, let us go down, and there confound their language, that they may not understand one another’s speech.”

So the Lord scattered them abroad from thence upon the face of all the earth: and they left off to build the city. Therefore, is the name of it called Babel; because the Lord did there confound the language of all the earth: and from thence did the Lord scatter them abroad upon the face of all the earth.

“Let us build us . . . a tower, whose top may reach unto heaven; and let us make us a name . . .” Just such grand aspirations seem to motivate many cyberneticians. Warren McCulloch, in 1953, addressed a joint session of the American Academy of Arts and Sciences, and the American Association for the Advancement of Science. The theme of the meeting was the Unity of Science, and McCulloch’s talk was entitled, “Mysterium Iniquitatis: Of Sinful Man Aspiring into the Place of God.” Most strikingly and eloquently, he spoke of his profound faith in the view of organism as mechanism, and of his certainty that the enigma of the mind—or brain—is soluble at least partly through techniques used in other scientific domains to crack other problems.

Many of McCulloch’s views and methods, if not his specific preoccupations and larger-than-life personal endowments, characterize other cyberneticians. He was driven by a restless, voracious hunger for knowledge and closure. In seeking keys to unlock the mysteries of the mind he was quick to grasp
and devour implications and applications from many scientific specialties. He saw science as a universal entity rather than as fragmented compartments. He had no hesitation in—and a large capacity for—learning and extrapolating knowledge and techniques drawn from other fields of inquiry. His immense energy, dramatic presence and flair for language enabled him to carry off with superb grace the role of eclectic. In any sense that it is possible to be one in the twentieth century, he was a Renaissance Man.

Cyberneticians share—in addition to belief in the centrality and power of the concepts of communication and control—the conviction that scientific methods, data and analogies constitute a practical unity. Whatever his specialized field of training or work, the cybernetician strives to be pan-disciplinarian in his attack on any problem. Nor is belonging to the classification of cybernetician limited to members of societies or graduates of programs which sport the term Cybernetics in their titles. As Cybernetics emerges more articulately and distinctly, more scientists will become aware that they are using cybernetic techniques and, indeed, are cyberneticians.

As recently as ten to 15 years ago, the designation Cybernetics was often regarded with some embarrassment as a usage which had been preempted by science-fiction writers, Europeans, con-men and cranks. Now there is a growing acceptance of the term in academic institutions and professional circles. If more cyberneticians would write of their thoughts and works in laymen’s terms—for regardless of our best efforts to master other fields we remain, humanly, laymen in all but a few—the discipline of Cybernetics might come into its own as a powerful master science. With all due respect to the growing technical literature in Cybernetics, the FORUM addresses that part of the discipline which is most difficult—communications. Here is the challenge to cyberneticians: Can you describe your accomplishments without resorting to jargon and abstruse or superfluously technical exposition? This will be the FORUM.

Milton S. Katz
From the Desk of the President

Labor Day has come and gone. Only three months are left till the end of the calendar year, and much has still to be accomplished. ASC's most important task, to bring a better understanding of Cybernetic principles and methods to a broad segment of the scientific community and those in responsible decision making positions, has just begun to shape up in different forms.

ASC has initiated the organizing of an educational unit which, it is hoped, will soon announce its plans for a comprehensive educational program (off campus) covering a broad range of cybernetic-related subjects. With the preceding issue of the FORUM we have begun a series of articles on courses and literature in cybernetics. We will keep our readership advised on the progress of these educational efforts, when classes will start, etc., either by announcements in the FORUM or through separate mailings.

* * * *

George Samaras has tendered his resignation as the editor of the FORUM, since he found it physically impossible to combine the duties and responsibilities of the editorship with a heavy laboratory program and preparation for his doctoral examination in chemistry. To my great regret I have been compelled to accept his request, and I extend to him our sincere thanks for his diligence, efforts and great enthusiasm in directing the destiny of the FORUM during the past year. All of us wish him godspeed in pursuing his academic plans.

Milton S. Katz, who has been a member of ASC for many years, has assumed the editorship of the FORUM. He received his B.S. degree in Social Science from City College of New York, his M.A. and Ph.D. degrees in Experimental and Physiological Psychology from the University of Rochester, N.Y. He is Consultant on Interactive Television to the MITRE Corporation in McLean, Va. Dr. Katz is experienced in education and training techniques and materials; man-machine systems design; and basic as well as applied research and instrumentation in social and biological sciences and technology, including Cybernetics. He is also the author of a number of articles in these areas. I am happy to introduce Milton Katz to you and look forward to a fruitful and constructive cooperation with him and his associate editors.

* * * *

The American Society for Cybernetics has launched a number of new projects in keeping with my recent announcements to you. We have two obligations:

1. to discuss and explain Cybernetics as an interdisciplinary science, a science which is deeply involved in philosophical subjects pertaining to our modern times and which is committed to providing the basis for a whole interdisciplinary edifice called Cybernetics;
2. to lend a helping hand in the search for solutions for the main problems which threaten our whole society.

If we believe that Cybernetics can offer the principal decision makers heading the government of our country (and the leadership of large organizational units in the public and private sectors) the kind of assistance they may expect from a society which claims to have a reasonable grasp of what we might today consider a full range of methods and concepts in Cybernetics, then we are, in my opinion, ready to play our part in trying to find solutions to some of the haunting problems of our country and our time. Policing methods are not very effective in a complex system, especially in view of the broad and sensitive information network covering most of the principal events down to their minute details, whether they be economic, social, political or any other kind. The goal of Cybernetics is to trace systems and sub-systems through variables, dependent or independent, to their functional relationships for the purpose of assisting complex systems to be self-regulating, anticipate "future shocks," and bringing us together instead of tearing the nation apart.

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Quoting from the Declaration of the Club of Rome which was issued after their meeting in Salzburg at the invitation of the Prime Minister of Austria at the beginning of this year:

... all the problems of our time are critically interconnected one with the others in a complex system. The world is faced with an unprecedented rate of change in economic, social, political and technological spheres. Much of this change has already caused great disturbance in world affairs as is evident today.

Command of science and technology has placed in the hands of the present generation tremendous power, both for creativity and self-destruction. The amazing amount of information possessed by man and the immense means and skills that can be mobilized would justify the hope that this power will be used for the fundamental betterment of all humanity.

However, all these resources are of little avail unless they are guided on a strong ethical basis by sound socio-political organization. The fact is that the industrial societies operate wastefully and stimulate unnecessary consumption. Furthermore, man lacks the will to coexist peacefully on this small and vulnerable planet. World society is torn asunder by growing and intolerable disparities in living standards and opportunities. Nations continue to follow conflicting policies. Justice within and among nations is remote. Hundreds of millions of men and women live marginal lives, without occupations and possibility of self-development. Nature is pillaged and poisoned for the benefit of a few, to the detriment of the many and of the yet unborn.

The present crisis is much deeper than an oil or energy crisis or a food crisis. Its negative effects will have many and diverse repercussions throughout the entire world. It is the poor nations and the poor classes who suffer when these things are scarce; or whenever trade, aid or currencies are used as political weapons.

This situation of crisis will be greatly aggravated with the rapid growth of world population from the present nearly 4 to soon 5, 6, 7 and more billion people, within a generation. To maintain or increase living standards an even larger increase in productive activities will be required. If these trends are to persist and no concerted effort is made to modify them towards new goals, they could be disastrous for man's future.

Mankind must and can face this challenge. An essential step is to give practical effect to a recognition of the reality of the interdependence of problems, peoples and nations. Such interdependence becomes ever more obvious with regard to political, economic, monetary and technological relationships. Much lip-service has been paid to this. Yet, in practice, nations continue to act as if they were in full command of their sovereignty.

* * * * * * * *

Two problems of great importance to the United States and the rest of the Western World, as well as to Japan, are inflation and the energy complex. Neither of them has, to my knowledge, been examined and intensively studied in the light of Cybernetics, although both appear to me to be classical examples of the extensive damage which complex systems in imbalance may suffer. No official solution is in sight for either of the two problems.

The cure for inflation which is being offered by the experts centers around the old house medicine and how big a dose to prescribe. Neither fiscal nor monetary policies can produce satisfactory answers for the simple reason that any manipulation of interest rates does not affect the causes of the loss of equilibrium but merely results in a policing action. Fiscal policies are very strongly affected by political considerations and these, in turn, depend to a large measure on the political composition of the legislature.

Applying Cybernetics to this problem should, in my opinion, start with clearing the decks of all systems suggested and applied and taking a completely new look at the problem followed by a statement and analysis of the problem and its objectives. A realistic model of the world around us should result. Functional relationships are to be clearly defined with the objective of highlighting the self-regulating forces. The model should point the way to achieving a new equilibrium when the prevailing and dominating elements have been affected and damaged by environmental factors.

The energy problem is to some extent similar in nature to the problem of inflation. The main difference, as I see it, is the uncertainty surrounding the secrets of future, not yet known, resources to restore those which are being depleted and how to provide substitutes when the presently known reserves have dried up. The major difficulty to be overcome by the Cybernetic approach to the problem is the international involvement of suppliers and users which requires a broader analytical concept.

Whatever the difficulties and obstacles in both instances, Cybernetics should be given a chance to participate in discussions and workshops structured under government or research institution auspices to help solve these more than nagging problems.
Information and the Information Industry*

Roy Herrmann
President, Center for Cybernetic
and Interdisciplinary Research, Inc.

Preface

The most drastic change in the last 30 years in our industrial environment was a logical interaction between some of the major elements in our industrial structure which led to the transition from the industrial to the service-oriented society. Mass production, which during World War II had peaked out, needed more sophisticated control measures. Information and telecommunication systems were introduced and took over the task of electrical and later electronic control procedures. Some of these had been developed by large industrial units, such as the American Telephone and Telegraph Company, International Business Machines Corporation, Control Data Corporation, and others. Undoubtedly they constitute information industry units, and a definition of this information industry in terms of a purposeful, self-regulating, goal-directed system is overdue and needed.

It is the purpose of this research project to examine this complex problem and develop a meaningful definition of the Information Industry.

I. The Evolution of Modern Society and the Impact of Information Systems

Change: the Order of the Day

In the last 100 years the American society has changed under the impact of technological innovations from a rural to an industrial society.

In 1973, John D. Rockefeller, III, said: “With change becoming increasingly the order of the day, our dominant concern must be not how to avoid but how to influence it in positive directions.”

To this may be added the observation that:

... a curiosity of modern economic life is the role of change. ... The innovations and alterations in economic life in the last seventy years, and more specifically since the beginning of World War II, have by any calculation been great. The most visible has been the application of increasingly intricate and sophisticated technology to the production of things. Machines have replaced crude manpower. And increasingly, as they are used to instruct other machines, they replace the cruder forms of human intelligence.

John Kenneth Galbraith, 1967

These changes and innovations have had an enormous effect on society. The “news” of better opportunities for making a good living in the “big cities” with their many attractions and job openings lured many young farmers away from the land which their families had been cultivating for generations. Newspapers, other information services (themselves innovations of the emerging information technology), and at times just oral communications, conjured up before the eyes of the younger farm population which wanted to escape the hardships of farm life the picture of a better life through well paying jobs.

The United States thus became a rapidly developing industrial society which created more and more jobs in what was gradually becoming symptomatic of the radical changes that were taking place—such as mass production and an ever-growing demand for capital and consumer goods.

Management sciences were an innovation of the Twenties. Engineering and management sciences together achieved further improvements, especially during World War II, resulting in higher unit production/man hour and in a substantial increase of the GNP accompanied by a downward trend in the employment of direct labor.

New information, communication and control systems were developed by scientists in institutions of learning and research, such as M.I.T., Carnegie Tech., and others. In the years following World War II, mechanical, and later electronic, information systems were developed which played a leading role in the emerging service-oriented society, a major step towards imminent vital changes in the composition of our society.

As the number of employees in direct labor jobs began to drop, services catering to the “fun” industry (amusements, travel, recreation and leisure time), the knowledge industry, news, libraries and other information services grew rapidly. Many former production workers, retirees and others found attractive employ-
to reflect the prevailing social, industrial and political rapid growth, the probability of further swift increases and stimulated by the sophistication and flexibility of high-powered information systems. The final results and achievements of the proposed study, and the use to be made of the findings and observations will have to reflect the prevailing social, industrial and political trends in our service-oriented society. The record of and achievements of the proposed study, and the use have an important bearing on this study.

An Historical Overview

A short historical overview of the societal developments of the last 100 years is necessary to understand why information science and technology appeared at the time they did and what logical role they are to play in our complex economy. The three historical development phases of our society (rural-agricultural, industrial and service-oriented) referred to have affected the image of the United States as our society passed from one to the other. In the rural period America was more an onlooker than an active participant in the events which stirred the Western World on the other side of the Atlantic. Our rural society had no real incentive to break out of its then existing mold. Only when new ideas and products began to show up is other parts of the economy was the rural society affected. It began to fade into history.

This is an important point in our changing world and should be remembered. However, it is also true that new products in general do not necessarily cause a whole new industry to be established. Individual products of different kinds can be manufactured by one and the same company. It was during the transition from the industrial society to the service-oriented society that this pattern changed and was replaced by a new model which reflected more accurately the impact of information science and information technology on the management of complex economic and manufacturing systems. In fact, it might be said that the new capabilities for acquiring information forced, and continued to force, the increasing integration of economic activities for the provision of goods and services.

The outline of the three historical phases which follows describes the essential factors to be considered in a logical and analytical interpretation of the transition from the rural society to our modern, complex, self-regulating, goal-directed society which combines and maintains some of the main features of the industrial and the service-oriented society in a kind of a synthesis.

Setting the Stage

The changes discussed in the preceding section should not, as stated, be viewed in isolation. They are related to each other as cause and consequence. All three phases are part of a larger matrix of change. The transformation from Phase 1, the rural society, to Phase 2, the industrial society, is comparable to a cocoon spun by a larva to protect it as chrysalis. In a mysterious way a new form of life enters the arena. The three phases of society could even be compared to three separate societal systems, with the second preying on the first and the third preying on the second. As the equilibrium of the first is upset, the following two must search for a new balance, probably on different levels.

The rural society was characterized by its conservative style of farming in which the individual farmer continued to apply the same kind of tools his ancestors had used. Information from—and to—the outside world flowed very slowly. Besides taking products to market and purchasing home and farm supplies there was little need to visit the commercial hubs nearby except on special occasions. News in general traveled slowly in those days, and this included the United States mail. Furthermore, the growth rate of the rural society was low. No real technological innovations had been introduced which would have changed these conditions at that time.

A near revolutionary development then took place. In the industrial field a change began to unfold. What these sudden technological developments, which had been slow in coming, meant for the total economy is best described by turning to the description of the construction of the first Ford model in 1903. The manner in which this change came about is highly revealing: Henry Ford had been preparing for this innovation by setting up the corporate structure of a new company, negotiating the funding of the manufacturing process for the new product as well as the other administrative details. This took six months to complete. Then Henry Ford turned to the production of his first automobile. Sophisticated planning and scheduling was unknown, exact measurements of the parts were not a requirement, ordinary steel parts were drawn from a warehouse as needed and were fitted together as the work progressed. It was not an exacting process. The time spent on initiation and completion was very short in contrast to the scientific methods applied to management controls today.

The end product, the first Ford car, was successfully introduced into the market, and the new corpora-
tion showed a good earning record from the beginning. Other products followed, and the change from a rural to an industrial society was under way. However, the increasing quantities of new products reaching the market to satisfy the rising demand lacked effective control procedures. As the markets were catering primarily to the middle and lower class income groups, the manufacturer had by necessity to install procedures for purchasing large quantities of materials to meet exact specifications, for accurately scheduling production time, the assembling of the parts, and for instituting scientific engineering quality controls. In spite of the Taylors, Galbraiths, Gantt's and others, the scientific management movement did not and could not take effective hold until information systems of a new kind were developed to supplement and supersede those managerial tools which were becoming obsolete. The requisite data were not rapidly or fully enough available.

Many of the procedures for acquiring or developing the information needed for effective planning, scheduling and control were developed during World War II. These information systems, first mechanical, then electrical and later electronic, replaced many staff functions as they provided automated services to manufacturers. IBM and others supplied the equipment on a rental basis. The important fact remains that these complex information systems became part of the manufacturer's equipment and an arsenal of managerial tools. The designer of information systems offered a service of sorts by assisting in the development of the appropriate components.

Summary

The foregoing overview and analysis of the last 100 years was a planned attempt to provide an empirical background as well as a basis for evaluating the three phases referred to as the era of the rural society, of the industrial society and of the service-oriented society, the last being the target of the proposed research project.

The transition of each phase to the next has been haphazard in a sense. A closer view and examination of the events which changed one era (or phase) to the next has, even in this rather cursory description, indicated that some major industrial developments are not planned but just happen.

II. The Information Industry—Definition and Economic Analysis

The Significance of the Preceding Historical Review

The three phases highlighting the transformation of our society during the last 100-150 years which changed our rural society to an industrial society followed by a service-oriented society, were reviewed in broad-brush form in the preceding section for the purpose of drawing attention to the slow beginning of the transition, its sudden explosive growth, and the present leveling-off of growth factors. Information and communication technologies began to play an increasingly important role as complex production control systems.

The preceding historical part of this article will be considered by some as too long, by others as too short. The purpose of the overview is to demonstrate, first, the uncertainty and instability of our society and, second, the role information and communication systems have played in this transitional period.

The following summary emphasizes the main points of these transition periods from Phase 1 through 3:

1. The rural society's principal activities were directed towards tilling the soil and producing livestock. The East Coast farmers were financially quite comfortably situated and primarily concerned with maintaining a certain stability of operations which provided the resources needed to sustain the family and keep home and facilities in reasonable repair. Many years ago and before the great depression, Wesley C. Mitchell summed this up as follows:

> When European settlers came to America, they brought with them the monetary usages of their various home countries in the 17th Century. But under the rough conditions of frontier life the colonists suffered a temporary recession to simpler forms of organization. They were short of coins and had to use commodity currencies at times—tobacco, wampum, beaver skins. They had to live more on their own, somewhat after the fashion of medieval villagers; the differentiation of occupation was simpler; financial machinery was scarcely needed and scarcely existed; the chief business of life was to get enough food and clothing, to build houses and clear land, to keep off the Indians.

Although confronted in the last part of the 19th Century with many uncertainties, the rural society was reasonably stable and not greatly affected by business fluctuations.

2. This changed with the appearance of the first major technological innovations. The development became explosive. Inventors, the business community and potential consumers quickly realized the growing need for fast and effective communication and the value of time. Telephone, telegraph and automobile were improvements of communications between trading centers and were useful in many other ways.

Information science and communication technology still in their infancy were soon accepted as important "tools" for sending and receiving messages. The profit motive played a major role and made all the difference in this sudden awakening of, and transition to, an

industrial society. Although the profit motive was an essential stimulus, the slogan which seems to have dominated the industrial scene was the desire to excel: more of everything—automobiles, telephones, faster trains, higher buildings, a seemingly never ending move towards “growth.”

Information—processed data—of detailed developments in the macro- as well as the micro-economic world, was needed for “feed-back” of facts on accomplishments and deviations from instructions to the decision maker, to the control function. Information was needed to “feed forward” instructions to the production and distribution units which were growing by leaps and bounds. Information and communication systems revolutionized not only the accounting field but also the area of managerial controls.

As information science and technology, as well as related techniques, became more common, corporate members of the private sector, individual operators and units of government agencies representing the public sector made increasing use, beginning in the Forties, of data processing equipment, first with mechanical and electric recording units, then with high-speed electronic computers.

3. When the demand and production curves turned sharply upwards, they carried with them urgent calls for badly needed control data to be applied by practically every complex system. Statistics and probability mathematics would scarcely have developed the sophisticated methods and techniques which have become “common language” and are applicable in high-speed, electronic computer systems. Yet, while it appeared as if modern man was equipped with omnipotent information, it was a rough awakening when information, predictive in nature, indicated that this society would have to recognize the ominous trend labeled “limits to growth.” The transition from industrial to service-oriented society met and still faces this additional problem: with population continuing to grow, the economic world is in serious imbalance and forced to recognize the need to adjust to a selected, limited (quantitative) growth pattern.

Communication and control, the cybernetic approach, have been serving industry for some time in conjunction with operations research and general systems approaches. “Information,” one important factor in any systems analysis, has been recognized as one of the most essential cornerstones in any modern, complex, goal-directed and purposeful system. Information is needed for penetrating the problems of the sub-systems and their interrelationships to one another. The dynamics of information systems interrelated to communication systems, to data feed-forward and feedback loops, are the target of this research project.

**Definition of the Term “Information”**

The literature defines the term “information” in descriptive as well as in mathematical form. The following descriptive definitions have been selected—for the purpose of this research project—from dictionaries, government publications and other sources. Those most applicable to the problem at hand are:

- knowledge, conception, ideal, oral verbalization, intelligence, facts, data;
- or more explicitly defined,
- the reception of knowledge or intelligence;
- knowledge obtained from investigation, study or instruction.

These definitions indicate that information as such is not measurable, has no economic value and is an abstract, a “non-matter.” As information is to be transmitted from the “message source” to the “message destination,” a gap exists which must be bridged in one form or another. To transfer a “non-value” is not possible.

The following flow chart illustrates this gap. It is based on C.E. Shannon’s *A Mathematical Theory of Communications* and describes five steps as follows:

```
   Information Source
       ↓
  Transmitted Message
       ↓
Transmitter or ENCODER
       ↓
Transmitted Signal
       ↓
Channel
       ↓
Received Signal
       ↓
Receiver or DECODER
       ↓
Received Message
       ↓
Message Destination
```

Noise and Distortion
1. The "information source" which produces a message or a series of messages can, for instance, be a person talking, and the message is then the oral expression of this person.

2. The "transmitter" or "encoder" is the next element in the communication system. The "transmitter" operates on or transforms the message, thereby producing a signal suitable for transmission over the "communication channel" (hereafter referred to as "channel").

3. The third element in this generalized communication system is the channel which carries the signal or signals, the output of the transmitter from the transmitter to the receiver. "The input to the transmitter is the message, and the output of the transmitter is the signal."2

4. The "receiver" or "decoder" will generally perform an operation which is approximately the inverse of the operation performed by the transmitter to reconstruct the message from the signal.3

5. The last step or element in this listing is the person or thing receiving the message for whom the message is intended. This step or element is labeled the "destination."

A message is the result of a complex transfer method without which information would remain abstract and invisible. No industrial process can be centered around nothing, and any information—like the cry of a baby signaling hunger—may be interesting news to the receiver of the message. The same kind of perception may be experienced with any type of knowledge signaled to the receiver, which by the way may be a human being or a machine. "It is entirely possible," says Norbert Wiener, "that a person talks to a machine and a machine to a person." Joseph Becker has this to say on "what is information:"4

When a child is born and opens his eyes for the first time, his brain immediately begins to receive and store impressions of the things he sees around him. These snapshots of the world recorded by the brain through sight are his first sources of information. . . . Somehow, every piece of information that reaches the brain is recorded in memory.

And further on he adds this observation:

Knowledge and wisdom can only result from understanding and using information. A knowledgeable person is one who learns to fit pieces of information into a pattern of thought that will lead to intelligent action.

The information received exists at first only in the consciousness of the receiving person or machine where it remains stored and invisible until retrieved. When this happens, the emphasis shifts to the communication system which prepares the stored information by transforming it to signals for transmittal to the "destination." The message thereby becomes an identifiable and measurable product. This process of drawing on a message source, transforming and passing the message on to its point of destination, is the function of an individual or an organization that deals in processing of messages.

The Information Industry as a Total Complex System

The "Information industry" lacks an explicit definition without which the designation remains loose and vague. Although other names have been proposed, such as "information handling and processing industry," or "information technology industry," none of these characterize this group activity as well as the first named term; they are either too restricted or too general.

A further difficulty in any search for an appropriate name for this industry is the little we know of the structure and composition of this industrial activity. We believe that no serious attempt has so far been made to state this problem in clearly defined terms by means of an analysis of the problem and its objectives.

Paul G. Zurkowski, President of the Information Industry Association, believes that "available information exceeds an individual's capacity to evaluate it." He contends that this is a "universal condition since the information seeking procedures of individuals are different at different times for different purposes. A multiplicity of access routes and sources have arisen in response to this kaleidoscopic approach people take to fulfilling their information needs."

In a memorandum the IIA outlines a plan for a "National Program." It lists all kinds of activities members of the information industry community could be involved in. Among others, this list emphasizes the totality of explicit physical means, formal and informal, for communicating concepts and ideas, including but not limited to, telephone, television, radio." However, in our opinion these listings do not cover the characteristics which are required for formulating a definition of the term.


3 While going through the channel, the signal may be altered by noise or distortion. In principle, noise and distortion may be differentiated on the basis that distortion is a fixed operation applied to the signal, while noise involves statistical and unpredictable perturbations. All or part of the effect of distortion can be corrected by applying the inverse operation or a partial inverse operation, but a perturbation due to noise cannot always be removed because the signal does not always undergo the same change during transmission. In practice, the gamut of perturbation runs from noise to distortion. The input to the channel is the signal, sometimes called the transmitted signal. The output of the channel is the received signal, supposed to be in some sense a faithful representation of the transmitted signal." (Raisbeck, op. cit.)

The memorandum states further that "the information industry (is) devoted to anticipating information interests, filtering information abundance and directing ideas and concepts to specific fields of perception, in the most cost-effective and useful communications media.

"The information marketplace is the value exchange mechanism," according to this memorandum, "by which an individual’s right to choose information is protected."

The above quotes refer to activities and functions but not to a definition of the information industry. On the other hand, we have identified one important element as one to be incorporated in the final definition of the term. This element stipulates that only an industrial unit using exclusively or preponderantly information transferred into messages as its stock-in-trade can claim to be an eligible member of this particular industry group. The content of the message, whether knowledge, news or instruction, has no bearing on the definition of the industrial information unit, which may be a corporation, an institution or a government agency, as long as the information is stored and transferred in a large number of messages.

Applying the total systems approach to this study, we are assuming that the information industry is identifiable by the sample space represented by all eligible units of this industrial complex. One of the main objectives is to identify homogeneous groups of companies and organizations in the public or private sector which have like elements linking them to the total system. Homogeneity, especially in this study, must be considered as a relative matter. All units identifiable as sub-systems are parts of the same total system and must have some elements in common which identify them as homogeneous units grouped by degree of homogeneity.

All units which are elements or parts of the same total system must have some characteristic element in common identifying them as homogeneous groups on a limited basis. Every business enterprise is unique in many important aspects. Its products differ, its capital structure differs, even the job specifications may differ widely from those of every other enterprise or organized activity in the same functional area. The larger the number of corporate or otherwise structured units within each group which can be matched by identical characteristics (elements), the more readily can these units be lumped together and categorized so that they clearly represent interrelated and interacting subsystems of the so-called "Information Industry."

Assuming the existence of a multiplicity of interacting sub-systems made up of more or less homogeneous industrial productive or service units, the "ordered" grouping of these sub-systems, first, by characteristics (elements) and, second, by degree of homogeneity, will be attempted as the homogeneity of these groups has a direct bearing on the validity of the definition.

The target for this study is to determine the feasibility of defining the total complex system as an industry, as an important parameter within the national economy and, more specifically, a system representing the activities in the form of an input-output model of how the "information industry" makes use of:

1. information science—the way different people and organizations use information in their jobs; "effective methods for giving them the kind of information they need to do their job best;" and
2. information systems which provide the communication channels for distributing information and knowledge to users.

This part of the study is in process at present, and the results of the investigation, specifically the completed definition of "information industry," are to be made available when the comprehensive study referred to in a foregoing section of this article has been completed.
Dialogue, Dialogic, Dialectic: A Sketch of Jürgen Habermas' Theory of Communicative Competence

by Richard Herbert Howe
[Cybernetician No. 6, p. 30-36 (1974)]

Note on Jürgen Habermas: Jürgen Habermas is one of the most respected, outspoken, and controversial contemporary exponents of the Critical Theory of society developed by Max Horkheimer and Theodor Adorno of the Institute for Social Research and the University of Frankfurt. Habermas' work ranges over linguistics, sociology, psychology, and philosophy. Two collections of his essays, Toward a Rational Society and Theory and Practice, and his book Knowledge and Human Interests are presently available in English (Boston: Beacon Press); another, on his theory of communicative competence, is forthcoming. His studies of the antinomies of systems analysis in social research, based on analysis of the epistemological differentiation of the object domains of the two sciences, are invaluable provocations to anyone interested in "the application of cybernetics to social systems". Habermas is currently at the Max Planck Institute in Munich.

The following is an outline and interpretation of Habermas' article "Prefatory Remarks to a Theory of Communicative Competence" (in) Theorie der Gesellschaft oder Sozialtechnologie (Social Theory or Social Technology) by Habermas and Luhmann: Frankfurt am Main: Suhrkamp. 101-144 (1971).

"Dialogue in ordinary language moves halfway between monologue and the impossibility of linguistic communication."
—Jürgen Habermas.

I Toward delimiting communicative and linguistic competence. Elementary utterances, elementary sentences, elementary propositions.

Chomsky’s distinction between competence and performance does not take into account the fact that the general structures of possible-conversation are themselves generated by speech-acts. These structures are neither part of the extra-linguistic conditions that influence and restrict performance vis-a-vis competence in any conversation, nor are they equivalent to the linguistic expressions generated by linguistic competence. The linguistic structures of conversations are distinct from the linguistic structures in conversations.

Distinction between utterance and sentence: Sentences are linguistic units formed from linguistic expressions; utterances are "situated" sentences, pragmatic units of conversation.

Extra-linguistic determinates of competence and performance are the object of empirical pragmatics, a behavioral-scientific communications theory.

The general structures of possible-conversation are the object of a universal pragmatics, a theory of communicative competence.

The theory of linguistic competence studies the grammar of sentences; the theory of communicative competence studies the grammar of possible-conversation.

Speech-acts: speech-acts are the elementary units of possible-conversation. The speaker in a speech-act accomplishes the very action that the utterance performed portrays. Performative-utterances have a twofold sense: linguistic and institutional. This latter sense lies in the fact that an utterance performed institutes a "situation" or "context" for forthcoming (and previous) linguistic expressions. Linguistic expressions as performative-utterances are pragmatic-universals.

Speaker-listeners employ sentences in their utterances in order to reach agreement on "matters of fact."

The elementary conversational unit (speech-act, performative-utterance) has a double structure: as performative-sentence, and as logical-proposition.

There are two kinds of sentence: the dominating sentence and the dependent sentence. A dominating sentence is characterized by a 1st person pronoun as its subject, a 2nd person pronoun as its object, and a predicate in the present tense; its use is to establish a mode of communication between speaker and listener. The dependent sentence is characterized by a noun as its subject and a predicate of the referent of the noun; its use is to communicate a fact about an object.

Agreement requires that two Subjects meet simultaneously on two levels: 1) The level of intersubjectivity, which corresponds to the performative-sentence: Subjects speak with one another. [This level is Subject-generative.] 2) The level of Objects, which corresponds to the logical-proposition: Subjects seek agreement concerning "matters of fact." [This level is Object-generative.]

Dependent sentences are not always immediately propositions, yet they can always be changed into such via the appropriate change in the mode of communication and a corresponding change in the structure of the dependent sentence.
There are two kinds of linguistic usage: Reflexive usage and Analytic usage. In Analytic usage the meta­communicational (intersubjective) level serves only as a means for reaching agreement on the propositional (Object) level. In Reflexive usage the propositional level serves only as a means for reaching understanding on the metacommunicative level.

Three stages of abstraction serve to delimit communicative competence from linguistic competence. The zero-level of abstraction is the concrete utterance.

0) Concrete utterance: made in a specific situation and affected by extra-linguistic factors.

1) Elementary utterance: \( (0) - (\text{all extra-linguistic factors}) \). Determined only by the general structures of possible-conversation.

2) Elementary sentence: \( (1) - (\text{all actualization of communication}) \). Consists of linguistic expressions only.

3) Elementary proposition: \( (2) - (\text{all senses of pragmatic application}) \). Consists only of that which is necessary for the description or specification of a fact.


Five classes of words and their grammaticalizations determine the general structures of possible-conversation.

Although pragmatic-universals are metacommunicative, they are not components of a distinct metalanguage. Ordinary language is its own metalanguage.

Pragmatic-universals supply the conditions of possible-communication, they elicit the level of intersubjectivity. Hence they could be called dialogue-constitutive-universals.

Pragmatically, the most important aspect of the speech-act is the performative-sentence. There is still no adequate systematization of speech-acts.

Searle's classification of speech-acts by rules:

1) preparatory rule: establishes the application-conditions for a speech-act.
2) propositional content rule: establishes which dependent sentences are to be considered as propositional.
3) sincerity rule: establishes the "earnestness" of the speech-act.
4) essential rule: establishes the pragmatic sense of the speech-act.

Under Searle's fourth rule four further classes may be distinguished.

1) Communicativa: determine the general sense of the conversation.
2) Constativa: determine the sense of the cognitive application of sentences. [Note: here "cognitive" refers to rational in the sense of logical, propositional.]
3) Representiva: determine the sense of the speaker's self-portrayal.
4) Regulativa: determine the sense of the practical application of sentences.

Note on calculi: they are both more and less than linguistics. Less because they do not take into account any relation to conversational situations; more because as calculi of truth-values they relate to the pragmatics of application.
Examples of the four word-classes:

1) Communicativa: I say, I express, I speak, I talk, I ask, I answer, I reply, I counter, I contradict, I agree, I object, I repeat, I quote, etc.

2) Constativa: I assert, I describe, I report, I communicate, I tell, I clarify, I remark, I show, I explain, I predict, I indicate, etc.

3) Representiva: I know, I think, I mean, I hope, I fear, I love, I hate, I wish, I want, I decide, I bring out into the open, etc.

4) Regulativa: I command, I demand, I request, I remind, I forbid, I permit, I decline, I unite, I am responsible, I affirm, I empower, I announce, I excuse, I reject, I propose, I advise, I warn, etc.

Speech-acts prepare three distinctions fundamental to any communication:

Together these three distinctions lead to a fourth, decisive distinction: the distinction between a "true" consensus and a "false" consensus.

(What now follows is a search for a principle that would justify these classifications.)

III Communicative Action and Discourse. The Two Forms of Ordinary Language Communication.

Sense of the validity-claim of norms: Our notion of Subject rests on our normative assumption and expectation that a Subject can at anytime account for his actions, statements, opinions, etc. Thus we contractually presuppose in our recognition of a Subject intentionality and possible-legitimation.

These expectations lead to the assumption that a Subject's being a Subject means that the conversational mode can be shifted from that of communicative action to that of discourse at any time that consensus becomes problematic.

The contrafactuality of expectations leads to an idealization of all conversation. This in turn leads in every, even distorted, conversion to the possibility, as idealization, of reaching "true" consensus in the discursive mode.

<table>
<thead>
<tr>
<th>DISTINCTION</th>
<th>WORD CLASS</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) What-Is and What-Seems-To-Be</td>
<td>Constativa</td>
<td>to distinguish intersubjectivity from intrasubjectivity</td>
</tr>
<tr>
<td>2) What-Is-Essential and What-Is-Appearance-Only</td>
<td>Representiva</td>
<td>to distinguish the Subject from his utterances</td>
</tr>
<tr>
<td>3) What-Is and What-Ought-To-Be</td>
<td>Regulativa</td>
<td>to distinguish empirically observed regularities from the results of normative rules</td>
</tr>
</tbody>
</table>

This contrafactuality is Subject-generative in the dialectic of reciprocal recognition in that it presupposes that the self-objectivation of the Other is incomplete, and, hence, that the self-subjectivation of the Other is incomplete.

It is the paradoxical accomplishment of ideology that the obstacles to "pure communicative action" make the above norms truly contrafactual, and at the same time lend them legitimacy.

(The search for a principle justifying the classification of pragmatic-universals is now seen as the search for a principle that distinguishes between ideologically constrained subjectivity and subjectivity capable of actual discourse.)

Five cases of real or apparent discourse:

1) Discourse as means of communicative action (debates, etc.)
2) Communicative action pretending to be discourse (ideological justifications)
3) Therapeutic discourse (generation of discourse by analyst mediated self-reflection)
4) Normal discourse (paradigm, though questionable: scientific discourse)
5) Innovative discourse (learning [art])

Agreement is a normative concept. Hence consensus is a normative concept, hence intentionality and legiti­

mation are normative concepts. —In short, all contra­

factuality is normative.

In the case where ontology is denied criterion-status,

the motion of a search for consensus moves as follows:

The truth of propositions [distinction: What-Is/What­

Seems-To-Be; determining word class: Constativa] is de­

pendent on:

The genuineness of Utterances [distinction: What-Is­

Essential/What-Is-Appearance-Only; word class: Repre­

sential], which is dependent in turn on:

The correctness of actions [distinction: What-Is/­

What-Ought-To-Be; word class: Representativa], which is in turn dependent on:

Consensus vis-à-vis norms, which is dependent on . . .

[i.e., the cycle begins again].

Breaking out of this cycle without recourse to ontology requires a presupposed conception of an “ideal speech situation” in which any consensus reached is necessarily a “true” consensus.

V. Determinations of the Ideal Speech Situation

IF:

1) conversation means that two or more Subjects interact in agreement with one another or else search for agreement;

2) agreement means the generation of a “true” consensus;

3) “true” and “false” consensus can be distinguished only with reference to an ideal speech situation;

THEN:

there must be a “pre-understanding” of what this ideal speech situation is that is inherent in every concrete conversation owing to the communicative competence of the participants [and, hence, this pre-understanding defines that communicative competence].

It then follows that such a pre-understanding of an ideal speech situation is the necessary condition for any and all possible-conversation (whether communicative or discursive) and that the structure of this pre-understanding is the general structure of possible-conversation, i.e., the components of this pre-understanding will be the pragmatic-universals.

An ideal speech situation is defined: as a situation in which communication is not hindered by any external influence (Force) or by any compulsions resulting from the communications structure itself (neuroses, ideologies).

Unhindered communications structures means that all participants have equal opportunities in the selection and execution of each class of speech acts.

In detail: equal opportunity vis-à-vis

1) Communicativa—allows equal opportunity for continuing the conversation;

2) Constativa—allows that all “pre-understandings” get “on the table” [unspoken pre-understandings prejudice or constrain the communications structure itself];

3) Representativa—allows that intentionality and possible deception may be discovered through the behavior of the participants as actors, which implies equal opportunity vis-à-vis

4) Regulative.

Together numbers 1 & 4 are necessary conditions for effecting a shift in mode from communicative action to discourse.

It is not that the model of “pure communication,” the “ideal speech situation” requires this possibility of shifting into the discursive mode, rather the possibility of discourse requires this model of “pure communication”.

Truth, Freedom and Justice are the traditional terms for the symmetrical distribution of opportunities for the selection and execution of speech-acts that relate to propositions as propositions, to the relation of the speaker to his utterances, and to the observance of rules.

This “ideal speech situation” model of truth, freedom, and justice is not based on any personal qualities of the participants but on the structures general to possible-conversation [and, hence, on communicative competence, which can now be equated with autonomy and responsibility].

This construction is to serve as proof that we must assume the pre-understanding of an ideal speech situation, which can only be done via the four classes of speech-acts, whenever we wish to participate in any discourse.

Corollary: pragmatic-universals function as such only if they at the same time sketch out the ideal speech situation.

The conditions of possible-conversation are not necessarily apparent in and certainly not identical to the conditions of empirical conversation—so far.

The last, and most important structural condition of possible-conversation is that the speakers act contra­

factually, i.e., as if the conditions outlined above were actually realized. Hence the concept of an ideal speech situation is not merely regulative (as in Kant) nor existential (as in Hegel) because no society as yet allows these conditions to be met.

Hence the ideal speech situation may be compared with a transcendental illusion, but not so in the sense of being a metaphorical extension of a category of Reason, rather as a constitutive condition of possible-conver­

sation. Hence it is a constitutive appearance, and a pre­

appearance, a utopian moment.

It cannot be determined a priori whether this pre­

appearance is merely an illusion or is an empirical condition for the (even if only asymptotic) realization of its utopian moment. Hence it contains a practical hypo­

thesis. From that hypothesis the Critical Theory of society takes its departure.
Cybernetics at Illinois

A Report assembled by

Richard Herbert Howe and Heinz Von Foerster

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Urbana, Illinois 61801

To readers of the Summer issue of FORUM who found “Cybernetica at Illinois” puzzling, the Editor proffers apologies for having mangled a thoughtful, lively communication in the crush of expanding from a newsletter to a journal. To the authors, apologies cannot begin to suffice, for they rallied at the last moment in response to a call for help only to find their brain child hopelessly lobotomized. For both readers and authors, here is the only substantive remedy.

1. Cybernetica (H. V. F.)

1. DEPARTURE

The Departments of Electrical Engineering and of Physiology and Biophysics offer to their undergraduate and graduate students each semester general topic courses (EE 272, 490, and B.Ph. 199, 491). Since on earlier occasions a fusion of my sections of these courses into one class worked well, I contemplated offering for the Academic Year 1973/1974 a two-semester compound course for these Departments with a subject-matter that would not only have ramifications into the biological and the engineering sciences, but also perform an integrating function on these sciences as well. Cybernetics appeared to me as an appropriate subject matter. Particularly, thanks to Norbert Wiener’s explanatory clause for cybernetics as “Communication and Control in the Animal and the Machine”, I could pacify—though not enthuse—my colleagues in the life sciences and in engineering, for there appeared in the contemplated title the words “animal”, which would satisfy the former, and “machine”, which would persuade the latter. Moreover, a course on cybernetics would give me an opportunity to celebrate Norbert Wiener, this kind and competent man, by observing through this course the 25th birthday of his most beloved brain child.

However, unlike other disciplinarians who may not—ever should not—apply their competences to themselves (pyrotechnicians, analytic chemists, surgeons, etc.) the cybernetician must apply his competences to himself lest he lose all scientific credibility. What if the “expert” on communication and control cannot communicate, or excuses his irresponsible acts by claiming that he has been controlled by someone else? He will be placed among the fakes, of whom there are enough without him. Consequently, a course on cybernetics must be conducted cybernetically.

First of all, such a course should have at the outset, visible to all participants, a tangible primary goal that may, through interaction by the participants, evolve into others with conceptual ties to the first one; second, the topic should serve as a vehicle for an understanding of how the topic is understood; third, it should transform an accidental assembly of anonymous students into a group of interacting individuals; and, finally, it should account for this transformation. In search of an appropriate tangible goal for a course in cybernetics, friends suggested to me that a need in the scientific community could be fulfilled if the class created a collection of up-to-date Cybernetica. This, however, would require material support beyond providing an instructor.

Although this concept of a course as outlined before does not fit precisely the conventional image of an engineering class in a Midwestern university, I found moral encouragement in my departments, which was, because of the present state of financial affairs in institutes of higher learning, all I could hope for. Moreover, since this program proposes not to proceed along a path that has been demonstrably trodden before by many others, Governmental Agencies that support basic research today will ipso facto dismiss it as worthless, because its worth has as yet not been proven.

At that point, Point—a foundation on the West Coast—came to our rescue and bestowed the Biological Computer Laboratory with a grant. Since one of the rules of Point is not to respond to a proposal requesting a grant, we submitted our proposal after having received one. Here are some (modified) excerpts:

2. PROPOSAL

There is a hiatus between what is known and “common knowledge.” In developing countries like, for
example, the United States, this hiatus is widening at an accelerating pace. We shall not waste ink, time and patience to prove there is such a hiatus, nor are we going to argue that this is "bad." We shall simply address ourselves to the problem of how to narrow this gap.

This appears to be more than a herculean task, for it seems that the entire "educational machinery," from an infant’s way of learning how to walk and to talk, through institutionalized forms of instruction like those in kindergarten, grade and high schools, to institutions of higher and continued adult education, this machinery is attempting to do just that, and has failed: the gap is growing wider and wider.

We submit, again without proof, that this is so because of an almost universal confusion in which "knowledge" is seen as a commodity, i.e., is identified with substance rather than with process. We hear from distinguished speakers: "...Universities are Depositories of Knowledge that is handed down from generation to generation..." but—alas—A's nervous activity is just A's nervous activity and not B's. An educational system that confuses learning with the dispensing of goods called "knowledge" may cause some disappointment in the hypothetical receivers, for the goods are just not coming: there are no goods.

We are not proposing to aid this machinery by introducing still another device that is based on this delusion; instead we propose to provide the "initial ignition" to get the primary process going again. We allude here to the second order concept of "learning of learning" in which "subject matter" assumes the role of an arbitrary vehicle, a means for locomotion.

While cybernetics began by developing the epistemology for comprehending and simulating first order regulatory processes "in the animal and the machine", cybernetics today provides a conceptual framework with sufficient richness to attack successfully second order processes (e.g., cognition, dialogue, socio-cultural interaction, etc.).

We propose to make this conceptual framework accessible to a large and diversified audience by a publication whose design is the short range goal of this effort.

Knowing that this proposal would be accepted, it was now easy to compose the description of a course that would follow the outline of this proposal. Following a precedent established by Margaret Mead [31], I called this course "Cybernetics of Cybernetics."

3. COURSE DESCRIPTION

This description sufficed to discourage about thirty-four thousand potential participants (about the student body on our campus), for only 29 came and signed up for this course. In the beginning some of these students left us, but others came to join us and our group grew to 45. All years of academic progress, from freshmen to Ph.D. candidates, were represented—with a tilt toward the younger generation. Despite his own stringent schedule, Professor Herbert Brin from our Department of Music joined me in this venture; participated in almost all sessions, saw to it that our dialogue did not degenerate into monologue, and kept us alert to the crippling effects of language when it controls—

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**CYBERNETICS OF CYBERNETICS**

_instructor:_ Heinz Von Foerster

**EE 272 Bph 199**

**EE 490 Bph 491**

Fall Semester 1973, continued through Spring Semester 1974, 3 hours (1 unit) semester

Prerequisite: Consent of Instructor.

This is a project-oriented course. Its principal aim is to arrive at a format (model) for a publication (monograph, anthology, reader, source book, handbook, catalogue, primer, or whatever) that, when published, shall serve as a nucleus for a comprehensive presentation of the full range of methods and concepts in cybernetics as they are available today with regard to cognitive, social and cultural processes. However, a knowledge of cybernetics is not required as a prequisite in this course.

"First-Order Cybernetics" developed the epistemology for comprehending and simulating biological processes such as homeostasis, habituation, adaptation, and other first-order regulatory processes. "Second-Order Cybernetics" provides a conceptual framework with sufficient richness to attack successfully such second-order processes, e.g., cognition, dialogue, socio-cultural interactions, etc.

It is the purpose of this course to make this conceptual framework accessible to a large and diversified audience (from high school students to university professors, from local organizers of voluntary action programs to administrators of large civic systems), by a publication whose design should be accomplished on or about midterm of the Spring Semester, 1974. The book to be designed will be a thousand-page volume, 8½" by 11", to be run off on rotary presses. Moreover, besides its internally fully interacting organization by means of cross-referencing, concordance, glossary, and newly-to-be-developed graphic means, this volume is to be abundantly illustrated, comparable to McLuhan-Fiore's _The Medium is the Massage_ or the Whole Earth Catalog, so that going through this volume should be an intellectual as well as a visual feast.

Students who wish to participate in this course should be prepared to meet exacting production schedules and a considerable workload. Last day for dropping this course will be the date as posted in the University Calendar. Only those students should apply who believe in learning by doing.
instead of being created by—our thoughts. Kenneth L. Wilson played his double role as student and T.A. to perfection. He threw all his energy and empathy into this class, and that a tangible result indeed emerged goes to his credit.

4. PROCEEDINGS

Too much material has accumulated during the 60 sessions that were held in two semesters, and too little time has passed to allow for a comprehensive assessment of this course. Perhaps this can be done a later date.

(i) Groups: In the early stages of this course groups of two types formed: Production (P) Groups, and Subject-Matter (S) Groups. The former attended to specific tasks that were connected with attaining the "tangible goal," i.e., the design of the "book." P Groups were, e.g.: Abstracts; Directory; Format; Glossary; organization; etc. The latter attended to the preparation of literature and references, of questions and advice to the instructor, of handouts, and of choice of topic. S Groups were, e.g.: Artificial Intelligence; Information Theory; Language and Communication; Neurophysiology; Social Sciences; etc. Groups met in "meetings" according to their own scheduling outside of class. Class hours were called "sessions."

(ii) Chairpersons: Each session was chaired by a different class member (determined through alphabetical order) whose duties were to prepare this session, call upon group reporters, read announcements, conduct the discussions, adjourn the session.

(iii) Languages: During the Winter Semester it became apparent that discussions (and discussants) suffer when levels of discussion are confused. That is, when explicit distinction is not made between e.g., talking of the subject matter ("object language") [4], about the subject matter (understanding, "meta-language") and about the presentation of subject matter (planning, "meta-meta-language").

Two mechanisms were introduced which gave our discussions a quality quite distinct from before. One was to distinguish object-language from the other two by preparing an object-language vocabulary to be used during a session. The other mechanism was to provide means to make explicit reference to the language that was to be used. Three cardboard discs (Φ~6") worn by the instructor on a string around his neck, and colored black, blue, yellow (corresponding to zero, first, second order meta-language), indicated by their color which language was on the floor. The following handout illustrates one phase in this exercise:

Another mechanism to facilitate understanding and speaking meta-language was a (somewhat irregularly) scheduled internal publication, The Cybernetician, that

March 11, 1974 HANDOUT Session #45

An experiment conducted at the meeting of the Organization Group last Friday, March 8, shows that the least structuring of conversation may facilitate the maintenance of dialogue. Hence, we would like to repeat the experiment in structuring made at that meeting, in order to determine whether or not the same results obtain with respect to a larger group.

The experiment runs as follows:

Each participant is given five chances to speak. Each time that the participant speaks, he surrenders one chance, with the following exceptions:

1) The words "yes" and "no" are free.

2) Questions in the object ("black") language in direct address are free.

Direct address means: directed to the person who last has spoken.

Statements in question form (these are usually questions of agreement: "But isn't it the case (that...?" etc.) are not considered to be questions in the object language, and hence use up one speaking-chance.

The chairperson shall be the sole arbiter with regard to whether a speech falls under the exceptions listed, or is a legitimate speaking-chance.

Tallies of the use of speaking chances will be maintained on the blackboard by Steve Sloan.

A ten minute trial period will precede the strict implementation of the rules, in order that all participants have a chance to get a "feel" for how the rules work.

* * *

This experiment will be conducted in Session #46 on Wednesday, March 13, 1974. Please bring this notice to class with you then.

allowed a "speaker" to see on its pages himself and others in a new context. Moreover; it allowed the participants to become familiar with being on the production side of publications, a skill that was a prerequisite should the "book" be put together. Section II will briefly summarize this phase of activity.

To be concluded in the next issue.

5. REFERENCES

cal Computer Laboratory, University of Illinois, Urbana, 96 pp. (1972).


An Original Method for Trying to Define the Objectives of a Scientific Research Policy Corresponding to Real Needs*

Introduction

The qualitative aims of scientific research and the choices they entail are still a subject of passionate debate.

In this connection, a group of European officials not directly concerned with research problems recently carried out an original experiment in Brussels. The Group, which naturally has nothing permanent about it, was composed of men and women of different nationalities, ages, specialities and opinions. Its purpose was to think freely about the possible aims and options of scientific research in Europe. It intentionally avoided the question of military research.

We thought it would be interesting to summarize some of the results of this think-in. The views are, of course, those of the authors themselves and not of the European Commission.

1. A few questions

The governments of the western industrialized countries, especially the Community countries, have so far based their scientific and technical policies mainly on considerations of international power (or prestige) and economic growth; the objectives are often confined to a few privileged sectors (military research, atomic power, space, aeronautics, data-processing). Are these priorities, established over ten years ago, still justifiable today? If not, what new objectives should we strive for? What priorities should we adopt?

Competition through constant innovation is a trend fostered by the industrialized states and has directly engendered—if not actively provoked—a similar trend in private life. The rapid renewal of products, the constant encouragement to consume and to change, the unbridled economic expansion—despite the occasional expression of scruples or taking of precautions—are all established characteristics of modern industrialized societies. Should the public authorities continue to foster this trend? Does the pace of change allow sufficient control over scientific and technical progress?

2. A few simple truths

In reflecting about these questions, the "free-thinking" group thought it useful to restate what it considered to be confirmed truths:

- Most official working parties responsible for preparing high-level decisions are composed of men only.
- Whatever their respective fields, the members of these groups have almost all been through the mill of higher education. Their thought processes and criteria are comparable and they usually reach similar conclusions. The similarity of R&D policies based on their work, and the fact that the same policies have been followed unswervingly for more than ten years, are a striking illustration of this fact.
- Glimmers of originality or innovation are generally confined to the work of independent or marginal groups. Isolated original suggestions that occur in the debates or documents of official groups almost always disappear in the final documents or at best when the decisions are made.
- Official working parties seem to find it difficult to appreciate the real needs of the man-in-the-street, and especially their relative importance or urgency. In preparing for decisions, official groups tend to discuss matters between themselves, on the basis of their own knowledge or impression of the facts, rather than on the basis of the facts themselves.

3. A few general remarks

The following general reflections emerged from the group's discussions:

- The external trappings of modern life are too often confused with progress. The products or services lavished upon the consumer, and the systematic pursuit of innovation, distract or prevent him from expressing his real needs.
- Living in an industrialized and increasingly complex world, which he barely understands and in which he finds it more and more difficult to situate or justify his existence, the man-in-the-street is surrounded by a growing abundance of sophisticated appliances and products which he can neither understand nor control. He is their victim as much as their master.
- The constant stimulation of the production-consumption cycle by government and industry contrasts strangely with the slow pace of social reorganization, the adaptation of teaching methods and the provision of mass education.

facilities. All too often, when trying to control these adjustments, the authorities end up by not making them at all.

- The information given to the man-in-the-street (by the politicians, the employers, the trade unions or the commercial world) is mainly designed to mobilize or to seduce him, almost never to encourage him to make an objective or reasonable choice.

- A higher standard of living must not be confused with a better quality of life. In the industrialized countries the satisfaction of basic needs—the goal of a “better life”—appears no more urgent than the quest for a “fuller life.” It is becoming vital for individuals or the collectivity to create an acceptable quality of life and to understand their particular place, legitimacy, role and power (not purchasing power).

- The many forms of dialogue, consultation, participation and co-management that are generously proposed to today’s man-in-the-street (usually for the purpose of better assessing his needs) too often prove factitious. The concept of dialogue implies that the two parties admit that they may be wrong: this rarely happens.

- Finally, if it now appears that national interest and public interest are no longer always one and the same, perhaps we can find the way to promoting the general interest at Community level.

4. A few objectives for scientific research in the European Community

The group considered that the following priorities should be reflected in the allocation of funds for scientific research and technological development.

a. Social sciences

In the share-out of funds for research there is a tendency to overlook the sciences of man—the social sciences, economics and the sciences of decision-making, organization and operational research. These embrace a wide range of subjects which should be given systematic support. They include:

- **Information** (in the broad sense): General research into methods of collecting information: new types of opinion polls, consultation procedures and ways of assessing real needs (in industry, administrative departments, towns and cities, regions, countries, etc.). Research into methods of disseminating information (distribution techniques and ways of presenting the information, especially commercial information).

- **Education and training**: Teaching undoubtedly represents a key factor in the development of a more mature society in which all people benefit from social progress. But this is a particularly difficult task. To continue to impart a static culture, a passive knowledge, cannot produce the “men of dialogue” that modern society needs. Here, too, research can help considerably. Psychologists, psycho-sociologists, sociologists, educationalists can propose new approaches.

- **The organization of society**: Under this general heading a quantity of research could well be undertaken on the various existing or planned forms of social organization, with the aim of working out possible ways of improving them. Results would be submitted to the micro- or macro-communities concerned. This research could often be coupled with technical back-up research, particularly on electronics or automation.

- **Control over progress**: It is desirable to slow down somewhat the production-consumption cycle. This would require research and experiment to determine the economic and social repercussions—especially on labour—of a gradual switch from present products (made for quick replacement) to more reliable and durable products. At the same time we should study ways of channelling advertising towards more meaningful information.

b. Protection and improvement of human health and safety

These fields include a number of R&D activities which should be given greater priority. Unlike most other research objectives, physical well-being is an end in itself (reduction and if possible elimination of pollution and nuisances, early detection of diseases, nervous disorders, etc.).

c. Planning of the human environment and agricultural research

(Town planning, building, civil engineering, transport, communications, environment, agricultural productivity and technology, etc.)

5. A few suggestions

Would it not be advisable to work out a new method of assessing which R&D projects should be launched?

In view of the increasing effect of the “secondary fall-out” of science on society, would it not be advisable to develop a scientific theory on the objectives of science and ways of attaining them?

Would it not be advisable to encourage research in order to find new patterns of life more consistent with people’s aspirations than the way of life offered at the present time.

These, we repeat, are the ideas of a freely formed group of European officials. They commit no one but the authors themselves and are not, under any circumstances, to be considered as an indication of the opinion of the Commission of the European Communities. We thought it interesting to print them in order to show the importance that such a wide variety of people attach to the choice of objectives for scientific research.
The Psychology of Consciousness, Robert E. Ornstein, San Francisco: W.H. Freeman, 1973. 247 pp., illus. $3.50 (paperback)


Three recent books truly reveal the preoccupation of this age of ours. Whereas the medieval man looked out on an external world in which he found magic and mystery, modern man has found all the mystery within the cavernous depths of his own mind.

The present view of our brain rests on a general belief in an evolutionary expansion of the primate forebrain along the lines of three basic patterns characterized as reptilian (the "crocodile" in us), paleomammalian (the "horse" in us), and neomammalian (the "human" in us). Thus, brain stem, limbic system, and neocortex, which radically differ in structure and chemistry (McLean, 1973), replaced Father, Son and the Holy Ghost (in the concept of trinity) with that of the "triune brain." Note the 19th century dilemma (Darwin versus the Church) revived but in a new variation.

This sizable brain structure with its three evolutionary generation gaps (McLean, 1973)—it grew from the full human size of 1500 cm$^3$ some 100,000 years ago—is divided on its top into what we call "right" and "left" cerebral hemispheres.

In true Cartesian fashion most of us believe now that the left (the "major," dominant, "Aristotelian," or Apollonian) hemisphere is involved in analytical, digital, field-articulating, sequence-perceiving processes such as speech, language, writing, logical reasoning and related functions, all of which subserve rational decision-making for survival. Note that the Aristotelian hemisphere is replacing Freud's "secondary process" thinking. The cognitive mode of the right (the "minor," non-dominant, or "Platonic," or Dionysian) hemisphere, on the other hand, is analogical, synthesis-oriented, and non-verbal. It is a scanning mode of visuo-spatial gestalts and fields involved in symbolic and metaphoric signification; an intuitive, image-making and musical mode, basically identical with Freud's primary process.

In a more specific way, the following propositions and assumptions are implicit in the above Descartian split: a genetically-given structural and functional difference between the right and left cerebral hemispheres allows man to interpret the same stimulus configurations in at least two distinct ways; the two cerebral hemispheres mature at different rates during the development of the normal individual; the functional development of each hemisphere is contingent upon optimal hemisphere-specific stimulation and training during relatively fixed developmental periods; and, the scientific and technological Weltanschauung of our time contains a strong bias toward the rational thought processes characteristic of the Aristotelian or left hemisphere.

Our technological, scientific, rational belief system has resulted in an over-emphasis on the logical-analytical cognitive mode of the left hemisphere, and this in turn has precipitated a rebound effect, characterized by a dramatic over-compensatory swing toward the cognitive mode of the right hemisphere. The present-day symptoms of this rebound include a declining interest and participation in organized, pre-structured science and religion and a corresponding upsurge in experiential religious pursuits such as those offered by Eastern meditation, hallucinogenic drug use, and revivalistic, emotional-ecstatic, participatory rites (e.g., Sufi dancing). Other symptoms include increasing interest and involvement in the "esoteric sciences" and more generally all things magic and miraculous, such as astrology, numerology, palmistry, parapsychology, Tarot card and I-Ching readings, witchcraft, alchemy, and astral projection "out-of-body."

The swing from the left to the right hemisphere is not a new phenomenon. In the past two thousand years the pendulum has swung twice from analog, i.e., right-hemispheric cognitive style to digital, i.e., left hemispheric style, and back; it is now swinging toward the analog for the third time. Perhaps we have just
about passed the halfway point. The great outburst of creative activity that marked the first few decades of the century may be viewed as a result of an interhemispheric integration of the digital and the analog zeitgeist. Apparently, artistic and scientific creativity reaches a maximum at a point midway between a digital and a subsequent analog epoch, as it did in the Elizabethan age. Rattray Taylor (1954) believes that under extreme "patriism"—our digital times—spontaneity is too strongly repressed while under extreme "matrism"—our analog times—there may be insufficient discipline to school and direct the creative urge. The most interesting question, however, is whether the cut off points: when does a digital age become analog? Or how and where are we to divide the two cognitive modes?

According to Kuhn (1962), science has a continuous aspect and also a discrete aspect: the textbooks of science. How then do quantitative changes culminate in the emergence of a new (quality, or) textbook?

And, since the science of today is the mythology of tomorrow, do outdated textbooks first become petrified science and then a sourcebook of symbolism or "poetified" science?

The book of Ornstein is a matrictext, while that of Eccles can safely be considered as a patrist volume although both authors constantly attempt to maintain what is called "scientific objectivity." The Schützgebels make no pretenses; they speak about the electronic control of mind and behavior and mean it. Their book has a naive, joyful and charming quality. After all, this is an age of western individualists in a mass-age and we happily use new individual biofeedback and other mind controlling devices to replace the elitist mass media of the past like castles or cathedrals.

Robert Schützgebel quotes Platt to express his own feelings:

..."To be warm and full and free, these are our first needs... but... we also want, like children, to have sweet smells, music, pictures, entertainment, bright lights and powerful servants" [or servomechanisms? RF]. "We want to make magic, to run like the wind and to fly like the birds and talk across the miles and be as beautiful as poets and know how everything works."

The Schützgebels' list of practitioners, who bring about the technology of emotional change, starts with anesthesiologists, motion picture producers, psychiatrists and "street chemists" (both selling drugs), and ends with some musicians, clergymen and entertainers (reminding us of R.A. Heinlein's Stranger in a Strange Land). The goal of the new technology is not the removal of human emotion but rather the development of self-programmable psychic adventures. Man-machine encounter groups may lead to a better understanding of machines (and thus ourselves?). A Cartesian melody is clearly ringing through these lines although the Schützgebels are definitely matrists who just use left-hemispheric "analytical" gadgetry "to be in the picture:" "our body is a sensuous tool for making sensuous tools." No wonder that... "the Church—having had the benefit of some of the greatest scholastics, but not technicians—survived the Reformation but not the contraceptive."

The book of the Schützgebels is a clear right-hemispheric document with technological underpinnings; it is directed toward homo occidentalis, the spiritual gadgeteer. Gadgets not only improve the quality of life but assist in transcending problems of the human condition. We remember how Wilhelm Reich—some years ago—attempted to sell his Orgone boxes for the cure of orgasmonopia (lack of orgasm or not enough of it) and now John Lilly, the former dolphin and LSD-researcher, is selling, for only $900, plastic sensory isolation tanks enabling the buyer to float in suspended spiritual animation—History is the flashback of presents and re-presentations which never keep passing...
reversed? Why not say the “major” hemisphere is unconscious and computer-like, since in fact it is far better at calculation and linear-like analytic functions than the right half brain? The “minor” hemisphere does have language comprehension and at least a rudimentary verbal conceptual scheme; it is simply unable to utilize these for speech production or writing. The suggestion that it can do all these things unconsciously is not logically defensible, but neither is the suggestion that people can talk unconsciously (as they sometimes do). “Other-hemisphere” scepticism seems to be in the same epistemological boat as scepticism about other minds (Pucetti, 1973).

Ornstein’s book is truly a contemporary document of the West Coast. It contains everything that the counterculture—the readers of Psychology Today and the middle-class American under 35—always wanted to know about consciousness, the two sides of the brain, mystical experiences, meditation, the Sufis, the I Ching and all the other goodies lined up on the other side of the generation gap. The material of the book is neatly arranged within a unified world view with the vanishing point of the perspective somewhere between San Francisco and Big Sur (Esalen) on the West Coast.

Reading Ornstein after Eccles’ book is a relief! But reading Eccles after Ornstein may be a relief, too. Ornstein’s book is remarkable in many respects. It fills a need, indeed it is a best seller in the field, and for the right-hemispherically deprived and more or less affluent American has not been exposed to an artistic environment of Western literature. They’ve got an all-round left-hemispheric education fitted to the ignominious crew cut which is now happily out of fashion. It is in this airless vacuum that the imported Yogis, Zen and Sufi masters pump their right hemispheric Eastern cognition and, therefore, it is no wonder that Ornstein’s readers know more about tantric art than the rose windows of Chartre’s cathedral and are better versed in the I Ching than in the metaphorical poetry of John Donne. Hence, Ornstein had no choice but to walk along the footprints of an East-West rapprochement throwing the whole Western mystical and artistic tradition overboard. As to the other side of the coin: Ornstein’s merits are undeniable; he has broken with the behaviorist tradition of American psychology and established a textbook with a humanistic approach. Unfortunately, some of his admirers and followers believe that humanism is a fashionable “Sufisticated” mixture of meditation, Jung, Hesse, mandalas, health food, anti-science and ecology-watching; it is a person-to-person transpersonalized, a sectarian countercultured hodgepodge of disparate things in need of some pot and a melting pot.

I think that each American motel and hotel should present every guest not only with the customary Gideon bible but also with Ornstein’s book. When depressed and in need of right-hemispheric consolation the guest could turn on by turning to page 164 (a Sufi contemplation object) or read one of the many edifying Eastern parables.

The concluding remarks of this little essay should be addressed to the problem of continuous brain function versus dichotomized cerebral localization of function.

The crossed representation, (“decussation”) or perceptual mapping of the world in the brain implies an effective means of orienting an animal with respect to or away from a source of stimulation and also provides him with an effective motor control. The two ways of reality testing, namely approach and withdrawal, (or on, and off) are basic to our concepts of pleasure and pain and point toward the operational origin of the two fundamental axioms of two-valued (left-hemispheric) logic, “the law of the excluded contradiction” and the “law of the excluded middle” (von Foerster, 1970). Hence, survival value, truth value and logical structure of descriptions are all coupled to movement. Truth, or indeed the spirit of it, is a moving experience.

Cognitive map-making on the other hand may be more efficiently handled through “lateralization.” Apparently, the more abstract the cognitive maps are, the more advantageous it is to have them on one side. Note that the posterior speech area of Wernicke, the “speech center,” is the only asymmetrical enlargement in about 80% of left cerebral hemispheres (not in the 98% that would be expected from the left lateralization of speech). The acquisition of language—an abstract mode of mapping—has as a prerequisite the ability to form cross-modal associations. The Wernicke, or speech area, however, is the latest evolutionary structure and it could be argued that together with the other sequential performance involving—the motor-structures: all non-sequential cognitive activity is displaced (pushed away so to speak) to the right (Ommaya, 1974). What we imply is that there is no specific localization for gestalt-type imagery and music, etc., on the right side of the cerebrum because the non-sequential functions of cognitive map-making are simply pushed away from the left speech-motor areas. It would be, indeed, a fallacy to revert (or regress) once again to a mechanistic localization of cognitive skills. Clinical and perceptual evidence in fact suggests that left-handers—up to this point we only spoke about right-handed individuals—show a tendency towards bilaterality of hemispheric “specialization.” Furthermore, it has been reported that the degree of hemispheric lateralization varies between familial and non-familial left-handed groups.

I have to apologize now for not having reviewed the
three books but rather conducted a dialog with them. They are definitely a landmark. To me, they directly or—quia absurdum est—indirectly herald, assert and welcome this matrist age of Aquarius, with women’s lib, and all other libido libs (ad libitum) marching outright from the right side of the cortex in colorful costumes, followed by West Coast freaks, Apollo astronauts and other rugged and drugged individualists, ESP-fans, healers and assorted matrists playing sweet electronic-spiritual music founded on Rock! On their banners Malraux (1948) has written an intensely religious text which is also my leitmotiv:

...the greatest mystery is not that we should have been thrown up by chance between the profusion of matter and the profusion of the stars, but that, in that prison, we should be able to get out of ourselves images sufficiently powerful to deny our insignificance.

Roland Fischer

References

EDITORIAL POLICY. The Journal of Cybernetics and Information Processing is published quarterly on behalf of the American Society for Cybernetics. The purpose of the Journal is to publish original research articles in Information and Systems Sciences, with emphasis on relevant mathematical theory and practical applications.

The Journal is concerned with the broad spectrum of problems associated with communication and control in man and machine. Theoretical areas of interest include modeling, decision theory, optimization, pattern recognition, adaptive and learning systems and man-machine systems. Representative applications of interest include biological, social, economic and engineering systems.

While all contributions relevant to the theory, practice and methodology of Cybernetics are welcome, it is specifically the aim of the publications committee to encourage the submission of accounts of detailed case studies illustrating the applicability of available advanced theories to the modeling and control of complex systems.

Each paper submitted to the Journal for publication is subjected to a review procedure and the final decision regarding publication is based on reviewers’ comments. Papers or substantial parts of such papers that have already been published elsewhere will not be accepted for publication in the Journal.

Manuscripts should be submitted to: Professor K.S. Narendra, Journal of Cybernetics and Information Sciences, Department of Engineering and Applied Science, Yale University, New Haven, Conn. 06520.

1975 ELECTIONS

The following offices will be open for the 1975 elections:

President
Vice Presidents (Administrative, Awards, Education, Publications, Technical)
Directors to fill two vacancies
Secretary
Treasurer

In order to help the Nominating Committee secure the most qualified candidates, our members who have not yet done so are urged to submit suggestions as soon as possible. Only members of ASC will be considered. Please send your recommendations as soon as possible on the form below. Time is of the essence.

President: ___________________________________________ Treasurer: ___________________________________________
Vice President: ________________________________________ Secretary: __________________________________________
Administrative _______________________________________
Awards _______________________________________________
Education _____________________________________________
Publications __________________________________________
Technical _____________________________________________

Directors: ___________________________________________
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Please return promptly to:

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24 ASC FORUM Volume VI, Number 3—Autumn 1974
ASC COMMITTEE ON EDUCATION IN CYBERNETICS

As indicated in the Summer 1974 issue of FORUM (page 29), a Select Committee on Education in Cybernetics is being formed under the guidance of Professor Paul W. Howerton, Resident Scholar in the Information and Management Sciences, National Center for Alcohol Education (University Research Corporation), with the assistance of Dr. Milton W. Buffington, Adjunct Professor of Cybernetics, The American University; Professor Frank P. Rymer, Jr., President of University Sciences Forum and Regional Coordinator of Laurence University, Santa Barbara, CA; Professor John F. McCarthy, Jr., The George Washington University; Mr. Gary D. Bearden, ASC Vice President (Administrative); Mrs. Bonnie W. Dunning, ASC Vice President (Education); and ex officio member of the Organizing Committee, Dr. Roy Herrman, President of the American Society for Cybernetics.

The Committee believes that one of its short-range goals would be to reduce the uncertainty in the minds of managers and the general public about the multi-science, Cybernetics. Through the medium of short, general seminars on the overall subject area, industrial, institutional, and government management personnel could be persuaded to apply the power of Cybernetics in the managerial process.

CONFERENCE ON "COMMUNICATION AND CONTROL IN SOCIAL PROCESSES"

It is now about ten years since the Behavioral Research Council (for scientific inquiry into the problems of men in society) published A Current Appraisal of the Behavioral Sciences by Rollo Handy and Paul Kurtz. The list of contributors and advisors is impressive. We find among them such names as Barrill, Churchman and Mandelbaum. In those days Behavioral Research covered, in the main, anthropology, sociology, history, economics, political science, jurisprudence, psychology and education.

The emphasis has shifted toward communication theory, preferential behavior and general systems. In a sense this change may be considered prophetic since such categorization has not yet pervaded academia. Pessimism and a reluctance on the part of systems analysts to get involved in behavioral problems at all is more notable. (Emshoff, 1971). This is indeed unfortunate because now, more than ever, there is cause for concern over social and urban problems.

The conference on Communication and Control in Social Processes scheduled at The Annenberg School of Communications, University of Pennsylvania, 31 October-2 November 1974, is a hallmark in many ways:

With Norbert Wiener we see communication as the 'glue' that holds social organizations together. It ranges from communication within the family to the symbolic activities in politics, business, industry and to the management of large administrations. Communication and information processing technology plays no mean part in these primarily social ongoing processes.

Circular flows of information are probably the most pervasive organizational ingredients of any society. They imply control—whether intended or disadvantageous. They cause a variety of social problems, and they may account for the observation that many social processes develop 'a life of their own.'

Recognizing these facts, the conference aims to provide a platform for sharing knowledge about social communication and control. Advancing the cybernetics of our complex social world calls for solutions. While such solutions will not come easily, it is the purpose of the conference to help bring these problems into clearer focus.

The conference will bring many scholars together to discuss complex problems of this kind, to which the cybernetic approach might prove best adapted.

What indeed is the relation of systems theory to cybernetics? Is cybernetics the language and systems analysis the grammar? If so, a study of the grammar is helpful in knowing a language, but it is not sufficient.

Developments in communication and control (hence cybernetics) have been achieved in the field of engineering. Now we can apply these developments to social behavioral problems. At present, technical solutions are being called for, which may just exacerbate the problems. As a first step, we must seek to redefine the problems so that appropriate attempts at solution may be developed.

The conference will focus on problems with difficult solutions, certain to "raise the rafter" with exciting and critical dialogue. For those of us who have been working in the field, this conference will clarify some important issues. And the fresh look expected from some of the outstanding contributors who are new to cybernetics should be most stimulating.

The program for the Conference appears on the following pages.
A Conference

Sponsored by the American Society for Cybernetics and three schools of the University of Pennsylvania: The Annenberg School of Communications, The College of Engineering and Applied Science, and the Wharton School

October 31–November 2, 1974

At the University of Pennsylvania in Philadelphia

General Information

Theme
With Norbert Wiener we see communication as the "glue" that holds social organization together. It ranges from communication within the family to the symbolic activities in politics, business, industry and to the management of large administrations. Communication and information processing technology plays no mean part in these primarily social and ongoing processes.

Circular flows of information are probably the most pervasive organizational ingredients of any society. They imply control—whether intended or disadvantageous. They cause a variety of social problems, and they may account for the observation that many social processes develop "a life of their own."

Recognizing these facts, the conference hopes to provide a platform for sharing knowledge about social communication and control. Advancing the cybernetics of our complex social world calls for methodological, theoretical, and organizational solutions. While such solutions will not come easily, it is the purpose of the conference to help bring these problems into clearer focus.

Location
The conference will be held on the campus of the University of Pennsylvania, at:

The Annenberg School of Communications
3620 Walnut Street
Philadelphia, PA, 19174
Tel. (215) 594-7041

Steering Committee
Klaus Krippendorff (Chairman), The Annenberg School of Communications
Frederick Betz, The Wharton School
Fred Haber, College of Engineering and Applied Science
Paul R. Kleindorfer, The Wharton School
Noah S. Prywes, College of Engineering and Applied Science
Henry Teune, Faculty of Arts and Sciences

Registration
Until October 29, 1974, all inquiries should be directed to:
American Society for Cybernetics
1130-17th St. N.W., Suite 530
Washington, DC, 20036 Tel. (202) CY3-2617

For preregistration mail the tear-off registration form and a check to American Society for Cybernetics at the above address.

Fees
Conference fees including Banquet and Proceedings: $40.00
For spouses and students who may purchase their Banquet tickets and order Proceedings separately: $10.00

Hotel Accommodations
Rooms may be reserved by mailing the tear-off hotel reservation form to:
The Barclay
Rittenhouse Square East
Philadelphia, PA, 19103 Tel. (215) KIS-0300

Special rates, $18.00 for single rooms and $23.00 for doubles, can only be guaranteed to early registrants. The Barclay is one of Philadelphia's finest hotels, located at a fashionable spot near the center of the city, and is known for its excellent cuisine.

Theatre Event
On Friday evening, conference participants will have the opportunity to see a New Phoenix Repertory Production with Mary Ure and John McMartin in LOVE FOR LOVE by William Congreve, directed by Harold Prince.

This masterpiece of the Restoration stage will be presented at the Zellerbach Theatre on the campus of the University of Pennsylvania, adjacent to the Annenberg School.

Discount prices:
$6.40 front orchestra
$5.60 rear orchestra
$4.80 balcony

As seating is limited, registration by October 1 is recommended. After October 1, conference participants will have to compete with public sales.
Conference Program

Thursday, October 31, 1974

8:00  Registration

9:15  Opening
Heinz von Foerster, General Chairman of the Conference
Eliot Stellar, Provost of the University of Pennsylvania
Roy Herrmann, President of the American Society for Cybernetics
Klaus Krippendorff, Program Chairman

Incentives and Informational Controls

10:00  Chairman: Howard Kunreuther, University of Pennsylvania

   Keynote: On the Interaction Between Information and Incentives in Organizations
   Leonid Hurwicz, University of Minnesota, Minneapolis

10:30  Coffee Break

11:00  On the Agency Problem
   Steven A. Ross, University of Pennsylvania, Philadelphia

   Informational Aspects of Design of Enterprises
   Through Incentives
   Paul R. Kleindorfer, University of Pennsylvania, Philadelphia

   The Organization of Work and the Challenge to Management and Engineering
   William A. Hetzner, Illinois Institute of Technology, Chicago

   Informational and Incentives Control in Organizations
   Murat R. Sertel, International Institute of Management, Berlin

   Information Exchanges in a Negotiation Model on Transfrontier Pollution
   Henry Tulkens, CORE, Heverlee, Belgium

12:30  Lunch

14:00  Large Social Systems
   Chairman: Noah S. Prywes, University of Pennsylvania

   Keynote: Modelling Large Human Systems
   Lawrence R. Klein, University of Pennsylvania, Philadelphia

   Limitations and Uses of the Cybernetic Modelling of Social Systems

   Towards a Modest Empiricism in Human Transactions
   Doreen R. Steg and Rosalind Schultman, Drexel University, Philadelphia

   A Regionalized World Model to Disclose the Nature of Implicit and Explicit Socio-Ethical Presuppositions
   Frederick Kile, Aid Association for Lutherans, Appleton, Wisc.

   Modelling the Complex Organization
   Andrezej Straszak, Polish Academy of Sciences, Warsaw, Poland

15:30  Coffee Break

16:00  Data Analysis
   Chairman: Henry Teune, University of Pennsylvania

   Keynote: Data Problems in Systems Science
   C. West Churchman, University of California, Berkeley

   The Role of Dialogue in the Measurement Process
   Richard D. Mason, University of California, Los Angeles

   Data Analysis, Communication and Control
   Roy A. Welsch, Massachusetts Institute of Technology, Cambridge

   Social Network Analysis: An Overview of Recent Developments
   William D. Richards, Jr., Stanford University, Stanford

   The Statistical Analysis of Mutual Causation
   Malcom E. Turner, University of Alabama, Birmingham

18:00  Cocktails at The Barclay
19:00  Dinner at The Barclay
20:00  Keynote: The Cybernetics of Cybernetics
   Heinz von Foerster, University of Illinois, Urbana

Friday, November 1, 1974

Knowledge Structures and Society

9:00  Chairman: Fazlollah Reza, Ambassador of Iran to UNESCO

   Keynote: Public Policy Issues in Societal Information Structures
   L. Vaughn Blankenship, National Science Foundation, Washington, D.C.

   The Diffusion of Innovation in Society: The Case of Simulation - Public Policy
   John M. Dutton, New York University, New York
   William Starbuck, University of Wisconsin, Milwaukee

   Changing Frames of Order: A Socio-Historical Critique of Cybernetics
   Anthony Wilden, Simon Fraser University, Burnaby, British Columbia, Canada

   A Journalistic Cybernetics - Defining “Communication.”
   Richard F. Carter, University of Washington, Seattle

   The Cautionary Tale of the Seven-Day Hospital: Ideological Messages and Sociological Muddles
   in A Therapeutic Community
   Barbara Frankel, Lehigh University, Bethlehem, Pa.

   Telecybernetics: Today’s Challenge
   Danielle Mihram, G. Arthur Mihram, University of Pennsylvania, Philadelphia

   The Dullful Dreamer: Representations in Machines and Mortals
   Christopher R. Longyear, University of Washington, Seattle

10:30  Coffee Break
11:00 Panel Discussions I
On Designing Decentralized Systems
Robert T. Holt, Fred Bailey, Leonid Hurwicz, University of Minnesota, Minneapolis
Cybernetics of Cybernetics
Heinz von Foerster, University of Illinois, Urbana
Other emergent panel discussions and workshops to be scheduled

12:30 Lunch

Towards Social Control Theory
14:00 Chairman: Klaus Krippendorff, University of Pennsylvania
Degrees of Freedom in Social Interaction
William T. Powers, Northbrook, Ill.
Information as a System Relative Concept
A Systems Framework for Social Control Processes
Prymsel Pergler, Walter Buckley, University of New Hampshire, Durham

15:30 Coffee Break

16:00 Panel Discussions II
Information and Control in Formal Settings
On the "Deep Structure" of Cybernetics
Anthony Wilden, Simon Fraser University, Burnaby, British Columbia, Canada
Other emergent panel discussions and workshops to be scheduled

20:00 Theatre Event: Love for Love by William Congreve, directed by Harold Prince at the Zellerbach Theatre, The Annenberg Center, University of Pennsylvania

Saturday, November 2, 1974

9:00 Organizational Communication and Control
Chairman; Fred Betz, University of Pennsylvania

Keynote: The Aesthetics of Organizational Control
Russell L. Ackoff, University of Pennsylvania, Philadelphia

Where Is Mr. Structure?
Kenneth D. Mackenzie, University of Kansas, Lawrence

A Model of Interorganizational Communication Among Complex Organizations
Roll T. Wigand, Michigan State University, East Lansing

10:30 Coffee Break

11:00 Dynamic Mathematical models of Small Group Interaction Based Upon Balance Theoretic Assumptions
Joseph N. Capella, Michigan State University, East Lansing

A Theory of Committee Formation
Mary Lippitt, Kenneth D. Mackenzie, University of Kansas, Lawrence

Modelling the Task Group As A Partially Self-Programming Communication Net: A Cybernetic Approach to the Study of Social Processes at the Small Group Level
James R. Taylor, University of Montreal, Montreal, Canada

Information Flows in the Educational Process
Nancy Dworkin, New York University, New York
Yehoash Dworkin, Ideas Systems, Hyattsville, Md.
Bernard Brown, American University, Washington, D.C.

12:30 Lunch

14:00 Panel Discussions III
Emergent panel discussions and workshops to be scheduled upon request
Dear Editor:

I have read of some of the cybernetic courses being offered by various schools and thought you would be interested in the program being offered by one on the west coast.

A Masters Degree Program in Cybernetic Systems is offered by San Jose branch of California State University. This inter-disciplinary program is designed to provide students of all majors with an understanding of cybernetics and general system concepts. Principles of cybernetics, systems engineering and computer technology are emphasized in core courses. The curriculum is intentionally open ended, allowing the student to design a meaningful pattern of electives appropriate to career objectives.

Because of the interdisciplinary nature, the Cybernetic Systems Program is administered from the office of the Dean of Social Sciences through a director and advisory committee representing the major academic schools of the university. Approximately thirty instructors make up the teaching staff with over half being part-time instructors drawn from the professional community. At present, the core of the degree program consists of six required courses in cybernetics and general systems concepts. Appropriate selections can be made from over twenty designated electives or courses from related graduate programs can be taken to round out the students program. A steady-state graduate of about 125 full and part-time students.

Since its inception in 1968 and through 1973, the Cybernetic Systems Program has drawn a student body of 120 plus planned majors. During this period it has produced fifty three theses and awarded sixty one Master Degrees. A Total of about seventy five individuals will have been granted Master Degrees by July, 1975.

Persons wishing additional information about the program or course material should direct their inquiries directly to Norman O. Gunderson, Director; Cybernetic Systems Program; California State University, San Jose, California.

E.M. Duke
5948 Loma Prieta Drive
San Jose, California 95123
Conference Calendar

13-17 October 1974
37th ANNUAL MEETING of the American Society for Information Science (ASIS) on Information Utilities. Regency Hyatt House, Atlanta, Ga. Contacts: Dr. V. Slamecka, School of Information and Computer Science, Georgia Institute of Technology, Atlanta, GA 30332, or Robert McAfee, Jr., ASIS National Office, 1155 Sixteenth Street, NW, Suite 210, Washington, DC 20036

16-18 October 1974
JOINT NATIONAL MEETING, Operations Research Society of America and The Institute of Management Sciences, on urban, environmental and energy problems, San Juan, Puerto Rico. General Chairman: Armando Riesco, P.O. Box 234, Mayaguez, Puerto Rico 00708.

21-23 October 1974
SYMPOSIUM ON ADAPTIVE ECONOMICS, Mathematics Research Center, University of Wisconsin, Madison, WI. Proceedings will be published in book form.

27-31 October 1974
1974 INTERNATIONAL SYMPOSIUM ON INFORMATION THEORY, sponsored by IEEE, Center for Continuing Education, University of Notre Dame, Indiana.

31 October-2 November 1974
ASC CONFERENCE ON COMMUNICATION AND CONTROL IN SOCIAL PROCESSES, Wharton School, Philadelphia, PA.

28-30 December 1974
NORTH AMERICAN MEETING of the Econometric Society, San Francisco, CA.

CALL FOR PAPERS

1975 IEEE REGION 3 CONFERENCE AND EXHIBIT on Electricity and Expanding Technology, 7-9 April 1975, Sheraton Center, Charlotte, NC

Papers are invited on all aspects of electrical and electronic engineering, research and development of new technology as well as new applications. Authors may submit summaries (4 copies) to C.J. Wylie, Chief Engineer, Electrical Division, Duke Power Company, P.O. Box 2178, Charlotte, NC 28242. Deadline: 15 October 1974.

THIRD INTERNATIONAL CONGRESS OF CYBERNETICS AND SYSTEMS, World Organization on General Systems and Cybernetics, 25-29 August 1975, Bucharest, Romania

About the Authors

(In alphabetical Order of Last name)

ROLAND FISCHER

Roland Fischer is a cartographer of inner space and a biologist of the fleeting moment. A multidisciplinary psychopharmacologist with a Ph.D. from Basel (Switzerland), he was the first to initiate and edit an Int'l. Conference on Interdisciplinary Perspectives of Time (Ann. N.Y. Acad. Sci. 138, Art. 2, 367-916 (1967)) and to treat consciousness as a scientific topic (Science 174, 897-904).

From his 240 papers 130 were published while a professor of exptl. psychiatry and pharmacology at Ohio State University (1958-70). Now, he is a Research Coordinator at the Maryland Psychiatric Research Center in Baltimore and a lecturer and Clin. Professor with The Johns Hopkins and Georgetown University Medical Schools.

ROY HERRMANN

President of Center of Cybernetic and Interdisciplinary Research, Inc., and of Institute for Socio-Economic Studies, Ltd., Washington, DC; formerly, professor of management sciences and operations research. The George Washington University; professor, naval science, U.S. Naval Academy, Annapolis, MD; chairman, College on Logistics, a Subdivision of The Institute of Management Sciences. B.S., College Francia, Berlin; Doctor of Political Science and Economics, University of Rostock, Germany. ASC President, 1972, 1973, 1974.

RICHARD H. HOWE

Richard Herbert Howe obtained his degree from the University of Illinois in 1971. Since that time he has worked as a freelance writer, editor, and translator here, in Germany, and in Canada. He has been associated with the Biological Computer Laboratory, Department of Electrical Engineering, University of Illinois, Urbana, since 1969.

HEINZ VON FÖRSTER

Professor of biophysics at the University of Illinois, Biological Computer Laboratory, Department of Electrical Engineering. Physics diploma, Institute of Technology, Austria; Ph.D. in physics, University of Breslau, Germany. One of the founders, past chairman of ASC and actively involved in its development since 1964.
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