This special issue contains the paper;

"Relevance of General Systems Models and Theories"

prepared for the Fifth Annual Conference Far West Region, Society for General Systems Research,

Mansion Inn, Sacramento, California, October 24-25, 1974.

VOL III

NO 1

COMMUNICATION THEORY in the CAUSE of MAN

Notes on the application of General Systems Theory, Cybernetics, Information Theory, and related fields of Communication Theory to the strengthening of democratic institutions on our planet.

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CONTENTS OF THIS ISSUE

Section 3.9.7: Editorial Notes.

It has been a year since the last issue of the magazine COMMUNICATION THEORY in the CAUSE of MAN was printed. A letter was sent to paid subscribers on April 14, 1974, explaining the principal sources of delay to that date. These were (1) a general collapse of support services in the community, (2) a legal fight over Environmental Protection Agency rules for reducing automobile exhaust pollution which would have required the doubling of the price of this magazine to pay parking lot fees to have an automobile available for carrying on the business of production of this magazine, and (3) the gasoline shortage in the Spring of 1974 which required so many hours of waiting in gasoline lines that projects like this magazine almost died.

In April other problems developed which caused further delays. Instead of going into these, I shall state my general conclusions. I have concluded that the nature of the inflation, and the secondary and tertiary effects of inflation, plus the reduction in mobility coming from environmental protection rules, and the trends toward energy shortage make it no longer possible in our economy for a single person or small group of people to produce a magazine like CTCM, unless they obtain support from a number of organizations which have the power to help the magazine fight for resources.

My strategy for dealing with this problem is to edit the next few issues to show more practical applications to problems of local religious, political, and labor organizations and possibly relate more closely to the newly developing county-wide political coalitions. The function of this issue of the magazine is twofold: (1) to provide a summary of the nature of the COMMUNICATION THEORY in the CAUSE of MAN magazine and book project for presentation to local organizations, and (2) to provide a paper for presentation at the Far West Region Conference of the Society for General Systems Research.

To start getting publication of the magazine going again, I have been establishing closer contact with local people who are concerned over the maintenance of democratic processes and in civil liberties. In particular I have become more active in the San Jose Unitarian Church. My plan is to see how useful the concepts I have been developing in CTCM are to practical problems being studies by the Social Concerns Committee of the Unitarian Church.

One specific example is the case of a student from Vietnam, Mr. Nguyan Anh Tri, who has been ordered deported by the U.S. Immigration Service. Because Mr. Tri talked to Americans about the true conditions in Vietnam his government canceled his passport. Then the U.S. Immigration Service served deportation notice upon him, because he no longer had a valid passport. Since deportation to Vietnam under these conditions might lead to imprisonment or death, the Unitarian Social Concerns Committee is circulating petitions to the Immigration Service and Congress on behalf of Mr. Tri for humanitarian reasons, to try to rescind the deportation order.

Now let us look at what the physical and mathematical sciences can offer us towards a better understanding of these sociological processes. I can remember how hearing the lectures of Dr. Karl K. Darrow of Bell Telephone Laboratories as guest lecturer at Massachusetts Institute of Technology in 1941 inspired me to think about all physical and social phenomena as coherently related and eventually subject to scientific analysis. I particularly remember the founding meeting of the Society for the Advancement of General Systems Theory, later renamed Society for General Systems Research, at the Center for the Advanced Study of the Behavioral Sciences, Stanford, California, in 1954. I was further inspired by the lectures of a number of visting scholars at IBM Poughkeepsie and IBM San Jose, such as Dr. Leon Brillouin, whose lecture notes were later published as Science and Information Theory (1956), and Dr. Colin Cherry, whose lecture notes were later published as On Human Communication(1957). It later turned out that the institute that arranged for Dr. Colin Cherry's tour of the United States was financed by the U.S. Central Intelligence Agency. The financial backing of scientific research is not supposed to influence the results of the research. It appears that in this case the C.I.A. which often supports fascist dictators against democratic forces in other countries, and in particularly Latin America, in this case supported some scientific research which is leading toward the support of democratic institutions.

At a seminar at the First Unitarian Church of San Jose in February 1957 I proposed a principle of "maximizing negentropy being consistent with a principle of political and religious freedom." (SEPR No. 19-A) Later I found that Dr. R. B. Lindsay had formulated this concept in a more formal structure as the "thermodynamic imperative." (American Scientist, sometime in 1959) A psychiatrist who was director of the

national office of the Family Service Association in New York City then perceived a connection between Lindsay's "thermodynamic imperative" and Albert Schweitzer's principle of "Reverence for Life." Although there were a number of argumentative articles following in the scientific journals, there was never any real test of the principle published.

I propose that it is high time that Lindsay's "thermodynamic imperative" be tested, both empirically and theoretically. It is probable that his principle is incorrectly formulated, but approximates a correct formulation which has yet to be discovered. The first defect in Lindsay's formulation of the "Thermodynamic Imperative" is an over-simplification in terms of working to "increase order" which gives people a false impression that this principle favors fascist state systems. To correct this defect, I have proposed a modified thermo-dynamic imperative as follows: "Modified Thermodynamic Imperative"

> "All men should fight always as vigorously as possible to optimize the order-diversity balance in their environment, i.e., consume as much entropy as possible, in order to combat the natural tendency for entropy to increase and for order in the universe to be transformed into disorder, and diversity to be transformed into conformity, in accordance with the second law of thermodynamics." (CTCM File 232 p. 5)

Bowron Hale has pointed out another defect in the above statement, which is scheduled to be printed in the next issue of CTCM Magazine. I think that we have these series of difficulties in interpreting Lindsay's "thermodynamic impererative" due to our incomplete knowledge of a more general theory of systems from which we could derive theorems for physical systems, biological systems, and social systems as special cases. For the present, I will have to be satisfied with pushing for closer and closer approximations to the correct statement of the role of entropy in social systems.

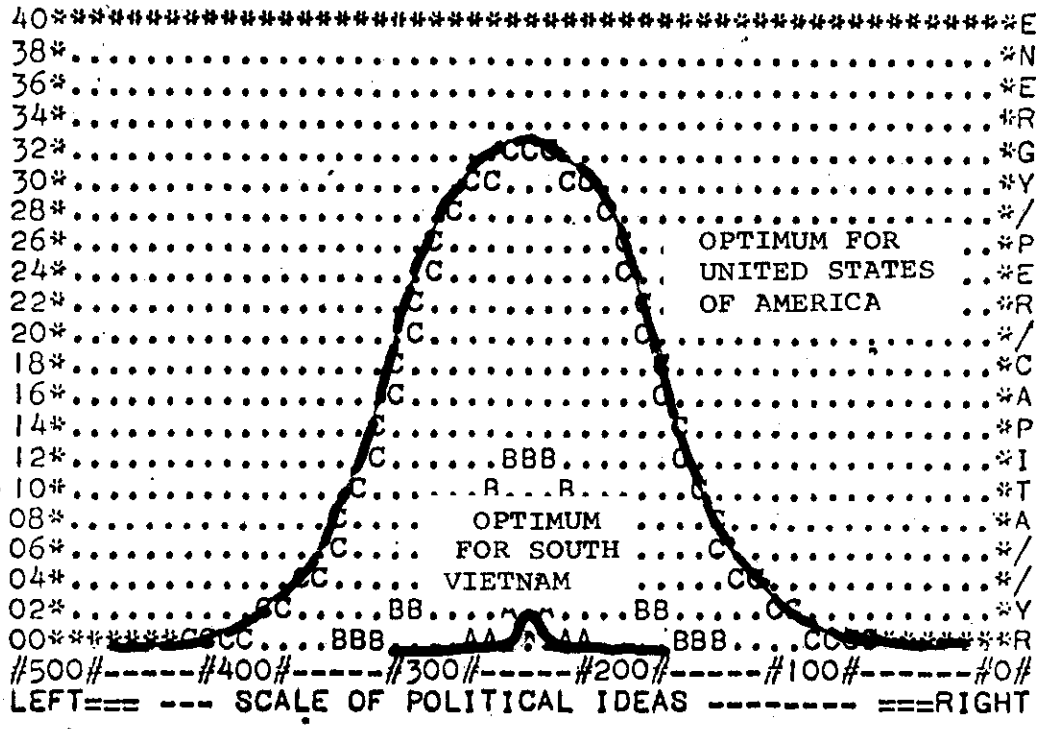
Now to get back to the problems of students from South Vietnam, such as Mr. Nguyan Anh Tri who came to the U.S.A. to go to college to get the training needed to help them develop their own country, but are now marked for imprisonment or worse, if they return. First I shall explore what can be said about South Vietnam and the United States of America in terms of the "thermodynamic imperative." To illustrate the principle, I shall use old data from the 1961 edition of the University of Chicago Atlas of Economic Development.

Country	Per Capita Electric Power per Year	Per Cent Population in Agriculture	Non-Agric. Sector Per Capita Elec. Power / Year
U. S. A.	3,797 kwh/cap/yr	12 %	4,320 kwh/c/y
S. Vietnam	17	59-70 %	51
N. Vietnam	10	59-70 %	30

Now I shall compare the state of development of the U.S.A. and South Vietnam in respect to the modified thermodynamic imperative. We need some kind of a mathematical model with which to relate this principle to these countries. I shall use Shannon's continuous channel model of a telegraph line system for analyzing the information content of the set of messages being transmitted over the telegraph lines. We shall use "Hypothesis 2" from the Book CTCM, File 305, p. 1 (Magazine CTCM II/4 p. 23)

Hypothesis 2: The negentropy of the probability distribution of political ideas in a sociological system can be approximated by the negentropy of the message distribution on a telephone cable for the continuous channel with limited average power. The assumed scale of political ideas is taken as a "measure of collective direction" or MCD. The resultant negentropy is considered as a measure of "dynamic-justice" -- a balance between maximizing democracy and maximizing organization to keep the system stable. The telephone cable pair is considered isomorphic to the sociological system, when the limiting average power in the cable is considered equivalent to the per capita power production in the sociological system.

Application of this hypothesis to an international systems of nations is developed in Book CTCM File 234, pp. 1-11(Magazine CTCM II/2 pp. 13-18, II/3 pp. 7-8, II/6A pp. 35-37) Optimum electric power distribution by political philosophies are shown in the figure below for these conditions:



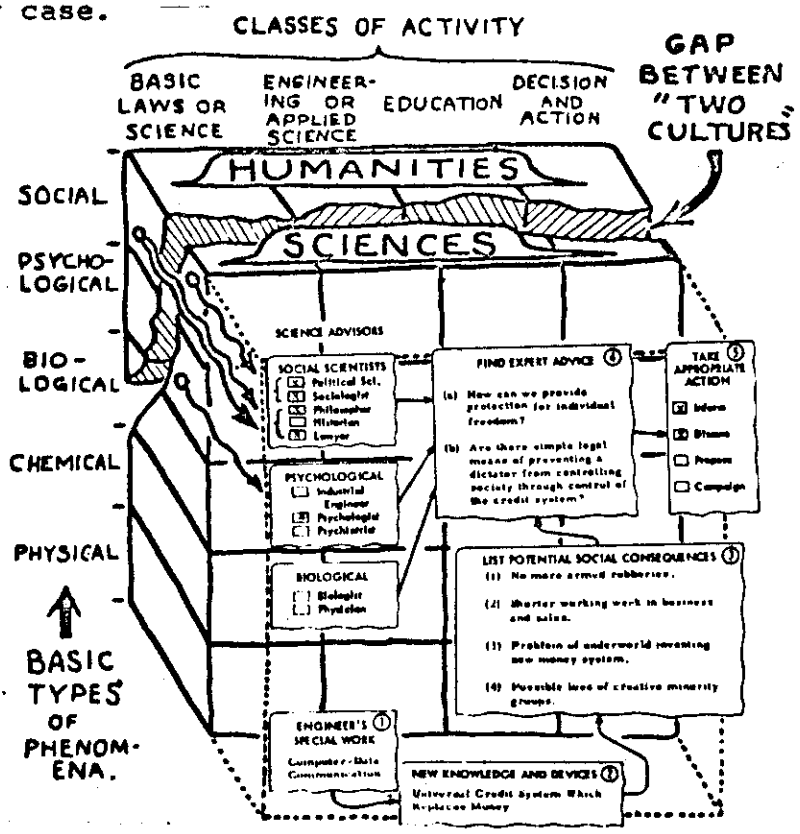
This theory doesn't say whether the country should be developed under capitalist, cooperative, or socialist forms of economic organization. It indicates that for optimum balance between diversity and stability for sustained economic and political growth that there is an optimum curve of distribution of political power. The optimum for South Vietnam with its relatively low level of industrial development gives a very narrow spread in tolerance of political philosophies as is seen from the curve above. Note that for a country with high average power per capita, like the U.S.A., that a very broad tolerance of differing political philosophies is required for optimum development.

This analysis indicates that we should advise foreign students to understand the difference between the optimum curves for our country and their homeland. Then they could develop a strategy to only criticize their own country in reference to the optimum curve that is appropriate. If the political leaders in their homeland can't stand even that level of criticism, the students should learn to discreetly inform organizations like Amnesty International about the injustices against political prisoners in their homeland, and concentrate upon learning the skills

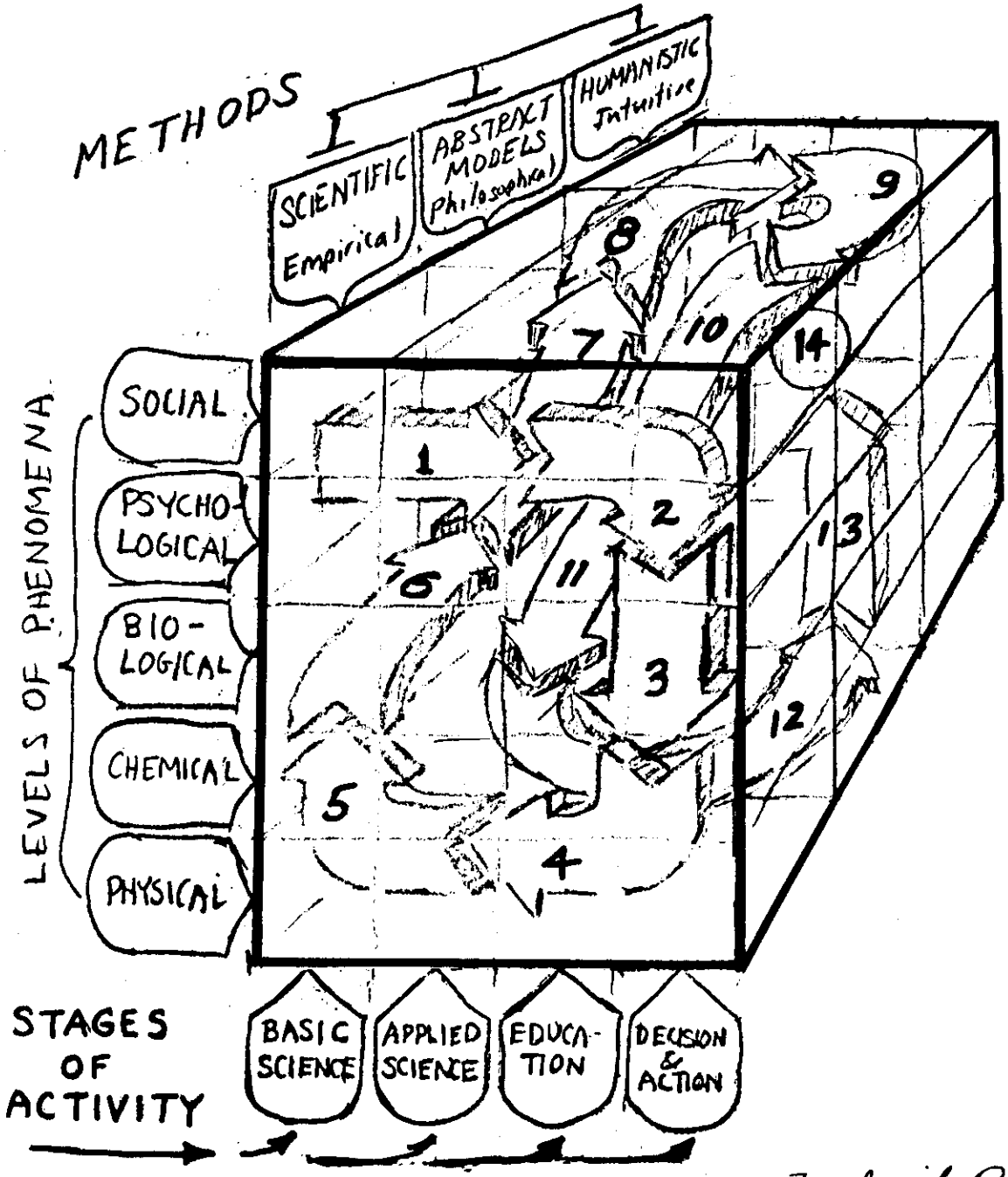
they came to this country to obtain. Then they could go back to their own countries and work within the system to bring their own country up to the appropriate level of freedom.

The above outline doesn't help students like Mr. Tri, who have already had their passports cancelled by their home government. For these students, we must re-examine the optimum curve for our own country, and take steps to petition the Immigration Service and Congress to grant the right of asylum to these students. If we allow such students to be deported to South Vietnam, we would be taking an unethical path of supporting a foreign government in departing further from its own ideal power distribution.

If this thermodynamic imperative we have used were a precise mathematical theorem, we would ask mathematicians for a completeness theorem to demonstrate that the mathematical theory was capable of completely describing the phenomena under study. Since as far as we know, it is not possible to develop a completeness theorem for biological and social systems, we must do the next best thing to test the validity. I propose that we use a "Quasi-Completeness Test" in lieu of a formal completeness theorem. A framework for such a test is shown on the next page. A sample quasi-compltness test for another problem, the discussion of the social impact of a cashless society, is shown below to illustrate the method for a simpler case.



A framework for a quasi-completeness test is shown below. The numbered arrows indicate the tracing of a number of steps through the intersection of different methods, levels of phenomena, and stages of activity to insure that no contributions from any field is overlooked in the study of important sociological problems.



Frederick B. Wood

This section of COMMUNICATION THEORY in the CAUSE of MAN, Vol. III, No. 1, serves a dual purpose:
(1) A paper for the SGSR Western Regional Meeting, October 24-25, 1974, Sacramento, California, under the title: "Relevance of General Systems Models and Theories." and
(2) A Special Preface to Volume III, No. 1, of the Magazine COMMUNICATION THEORY in the CAUSE of MAN.

Relevance of General Systems Theory

by

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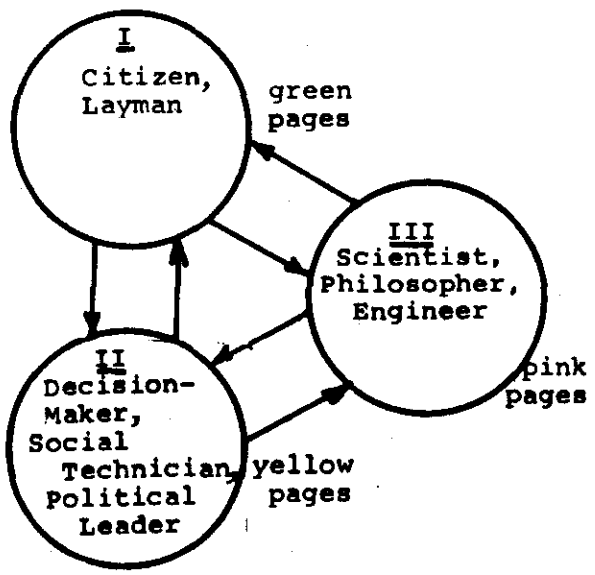
This paper is more about a technique for advising the people about the relevance of general systems theory to social problems. The complex problems disturbing human civilization appear to require the development of a cadre of multi-disciplinary scientists who can easily cross the traditional boundaries of the various fields of science. The most efficient way to do this is to develop a "general systems theory" from which many special cases can be perceived as subsets of the domain of this general systems theory. To date there is no accepted "general systems theory," but we have subsets in the form of a few special fields which exhibit isomprphies between different levels of phenomena, such as cybernetics and information theory. We should exploit application of such subsets to practical problems, while continuing our search for a more general theory that encompasses these subsets.

There are certain dangers inherent in the development of a "cadre" in that questions may be asked about who is going to benefit from this research. Are these fields of science and engineering going to be used for the benefit of all mankind? Or are they going to be used primarily for the private benefit of a particular ruling class? A method is needed to keep the public informed and to develop a large number of citizens educated to understand the basic concept of general systems theory. I am experimenting with a technique of writing about the uses of general systems theory on three levels at the same time, and in the same documents. To distinguish the material on the three levels I am using different collors of paper as is shown in the diagram on the right.



The bulk of this paper consists of samples of the more significant concepts diagrams, and tables illustrating work on the application of general systems theory on these three levels.

Reprinted from CTCM Vol. III, No. 1

BOOK ONE: INTERPRETATION OF CYBERNETICS, GENERAL SYSTEMS THEORY, AND INFORMATION THEORY FOR THE CITIZEN-LAYMAN.

(GREEN PAGES)

Although there is no generally agreed upon "general systems theory," many of parts of incomplete general systems theories and related fields like cybernetics, information theory, and computer simulation can be used to help the layman-citizen develop a better understanding of the complex social organizations of our society, so that he can better formulate plans for political action.

A classification of problems and crises is reprinted below from the 28 Nov 1969 issue of Science with permission of A.A.A.S. and the author John Platt for Vol. I, No. 7 -8

Table Classification of problems and crises by estimated time and intensity (World).

Grade	Estimated crisis intensity (number affected × degree of effect)		Estimated time to crisis*		
			1 to 5 years	5 to 20 years	20 to 50 years
1.	10^{10}	Total annihilation	Nuclear or RCBW escalation	Nuclear or RCBW escalation	✱ (Solved or dead)
2.	10^{9}	Great destruction or change (physical, biological, or political)	(Too soon)	Famines Ecological balance Development failures Local wars Rich-poor gap	Economic structure and political theory Population and ecological balance Patterns of living Universal education Communications-integration Management of world Integrative philosophy
3.	10^{8}	Widespread almost unbearable tension	Administrative management Need for participation Group and racial conflict Poverty–rising expectations Environmental degradation	Poverty Pollution Racial wars Political rigidity Strong dictatorships	?
4.	10^{7}	Large-scale distress	Transportation Diseases Loss of old cultures	Housing Education Independence of big powers Communications gap	?
5.	10^{6}	Tension producing responsive change	Regional organization Water supplies	?	?
6.		Other problems—important, but adequately researched	Technical development design Intelligent monetary design		
7.		Exaggerated dangers and hopes			Eugenics Melting of ice caps
8.		Noncrisis problems being "overstudied"	Man in space Most basic science		

* If no major effort is made at anticipatory solution.

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For further details see the Book CTCM, Section 1.1.3: National Priorities, File 113, pp. 1-2, (Mag. CTCM, I/7-8)

With the increasing realization by many people that they have little influence over the decisions of our complex corporations, banks, and government agencies, there is a need for a way in which to develop better models of the institutions to which we are related. Under the administrations of John Kennedy and Lyndon Johnson a war escalated in Vietnam without the traditional declaration of war people thought the constitution required. Under the Nixon administration many corrupt practices expanded in which the services of government agencies were perverted to the private use of the politicians in power. Throughout several administrations the C.I.A. subverted the democratic processes in foreign countries. The recent disclosures reveal how the C.I.A. under the direction of the "40 committee" spent some eleven million dollars to destabilize the Allende government in Chile. The present inflation is impoverishing many retired people who live on fixed pensions.

The concept of an elementary feedback circuit from Cybernetics can be used to help us understand complex systems.

The control of a furnace by a thermostat is illustrated in Fig. 1 below. The response of the room temperature is shown as a function of time im fig. 2.

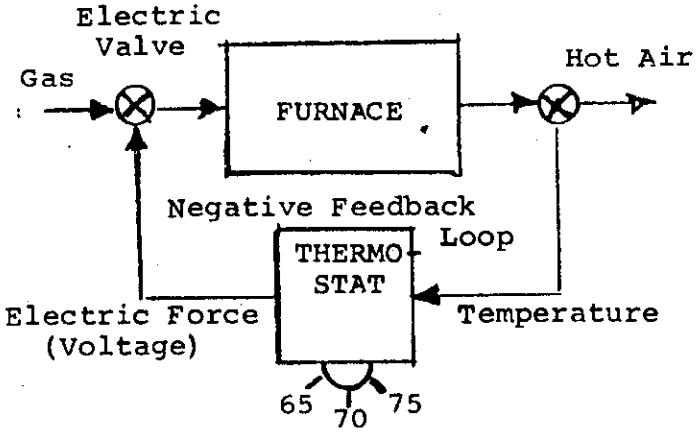


Fig. 1. Cybernetic Feedback Loop.

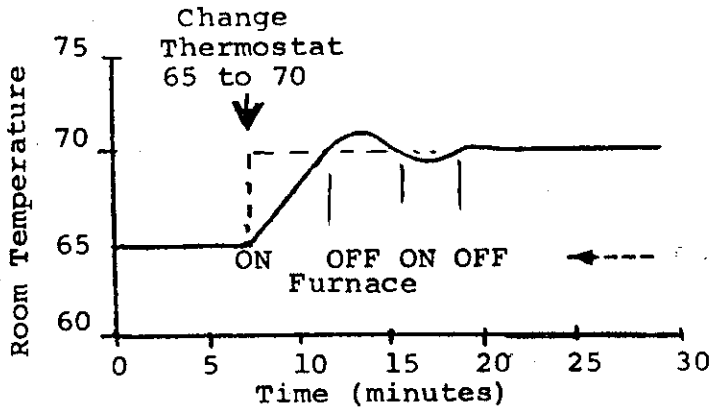


Fig. 2. Time Response of Room Temperature with Furnace Controlled by Thermostat.

Certain abstract concepts, like entropy from thermodynamics, can also be of help to us in understanding complex social systems. In 1928 the famous astronomer, Sir A. S. Eddington grouped categories of scientifically measurable and non-measurable values.* Examples of the first class are distance, mass, and electric force; of the second class are beauty and melody. He then found that entropy, the physicists's measure of the extent of non-usable energy, seemed to fit partly in both classes, making "entropy" a potential link between humanistic values and empirical science with it measurable quantities. In 1929 the Hungarian physicist Leo Szilard pointed out more clearly the relationship between entropy and information.#

CATEGORY	CLASS I	CLASS II
1) Distance	X	
2) Mass	X	
3) Electric Force	X	
4) Entropy	?	?
5) Beauty		X
6) Melody		X

Table I. Classification of Categories

Consider the categories in Table I, based upon the discussion of A. S. Eddington. The first three are obviously related by their common property of being physically measurable. Items 5 and 6 cannot be weighed or measured. There is something about beauty and melody which is not reduced to measurable units. These categories involve emotional feelings which are complex, yet they are more fundamental in human development. Does entropy belong in Class I or Class II?

Entropy is a measure of the ratio of disorder to order, a measure of something similar to beauty and melody, so it might belong in Class II. Yet at the same time, entropy in thermodynamics (the relationship between heat and mechanical work) is a measurable quantity defined by equations. Thus the concept of entropy becomes a potential link between the scientifically measurable and the emotionally beautiful.

The amount of information (but not the meaning of the messages) in an analysis of the messages sent over a telegraph line is equivalent to the concept of entropy in thermodynamics. The mathematical theory of communication (information theory) establishes a measure of the amount of information in a message based on the probability of the message being sent.

In information theory the negentropy (negative entropy) or communication entropy of a message of n symbols, each symbol having a probability P_n, is:

$$H = - (P_1 \log P_1 + P_2 \log P_2 + \ldots\ldots\ldots + P_n \log P_n)$$

The condition for maximizing H for a fixed n, is that each of the symbols has an equal probability.

For further details on feedback loops and an elementary treatment of "entropy" see the following sections of the Book CTCM:

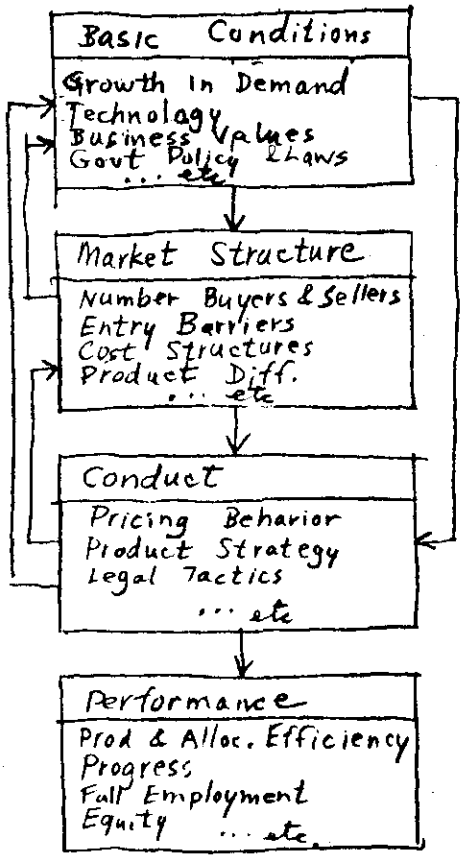
Section 1.0.2: The Thermodynamic Imperative -- Star to Steer by in a Disconnected Society File 102, pp. 1-2(Mag. II/1)

Section 1.0.3: Heating Systems and the Concept of Entropy. File 103, pp 1-2(Mag. II/5)

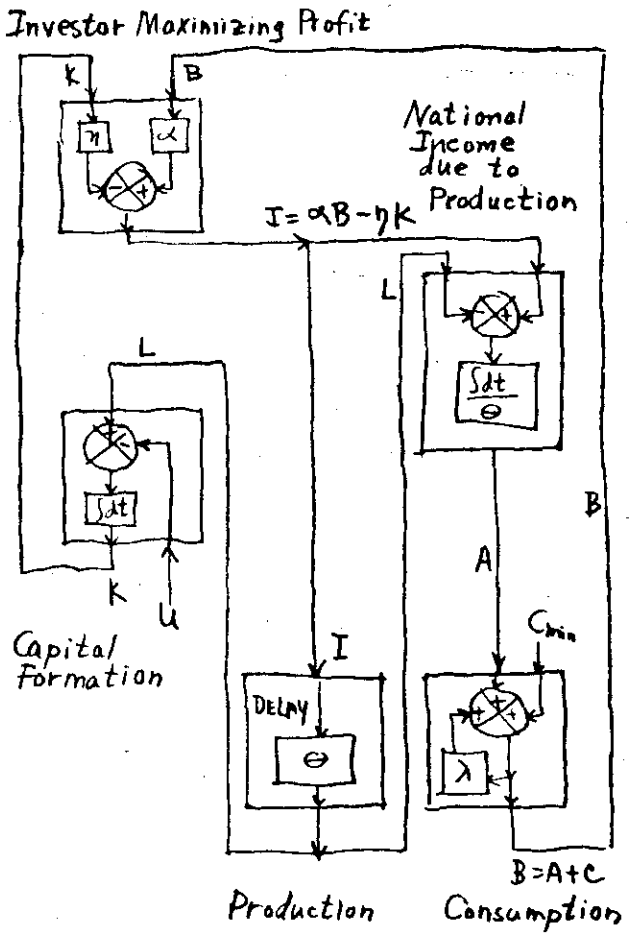
BOOK TWO: APPLICATION OF PRINCIPLES OF CYBERNETICS, GENERAL SYSTEMS THEORY, & INFORMATION THEORY TO PRACTICAL PROBLEMS. -- WRITTEN FOR THE SOCIAL TECHNICIAN AND SYSTEMS ENGINEER.

From Cybernetics, General Systems Theory, and Computer Simulation Programming we can design approximate models of our economic system with which we can develop a better understanding of the system, so we can make wiser decisions.

Micro Economic



Macro Economic-Simplified



For further details see the Loose-Leaf Cumulative Book: CTCM, Division 1.6: An Integrative Framework for a New Frontier. (Magazine Vol. I, No. 10-11)

From Information Theory we can develop an equitable allocation of scarce bulletin board space. By using the formula for relative quantity of information in a corresponding telegraph message, we can allocate bulletin board space in proportion to the new information generated by each group multiplied by the membership of each group. Sample distributions are shown on the next page.

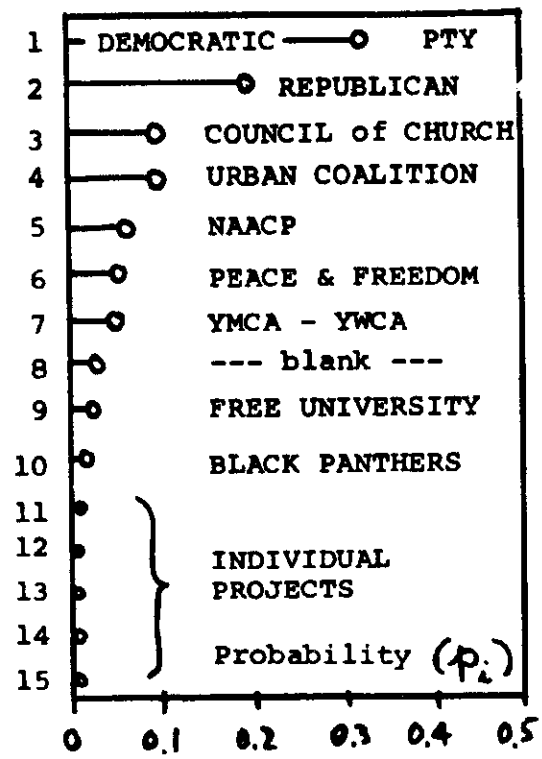


Fig. · Probability of Different Preferences

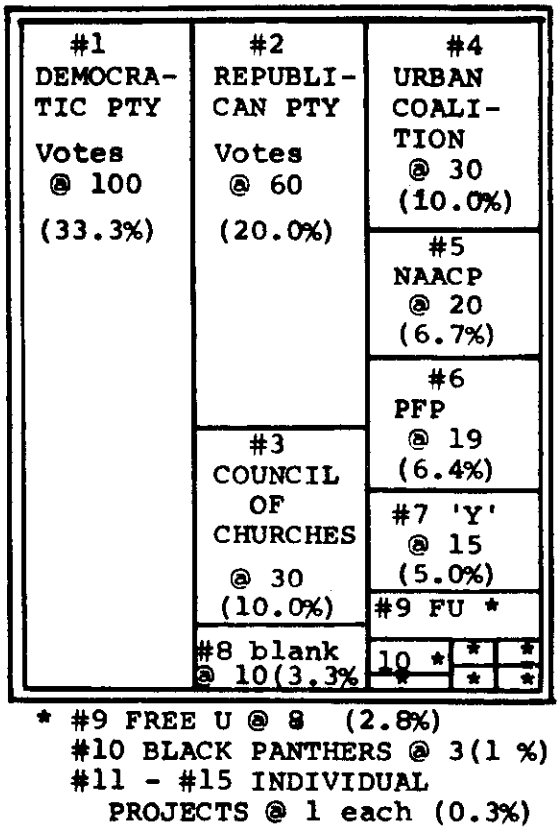


Fig. · Distribution of Bulletin Board Space in Proportion to Preference Probability

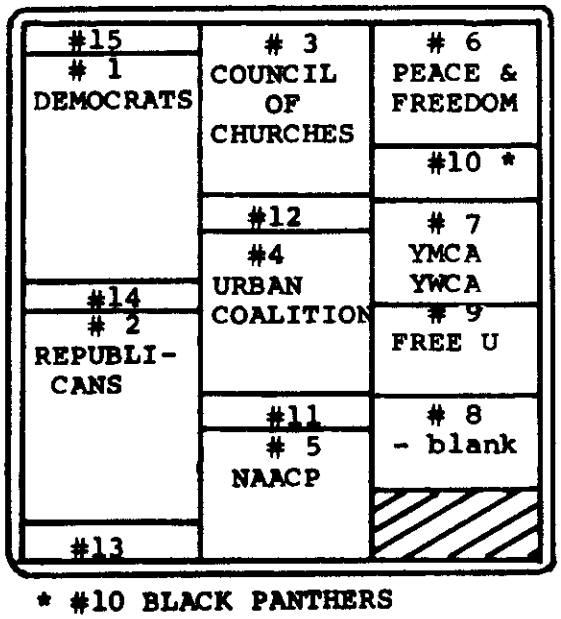


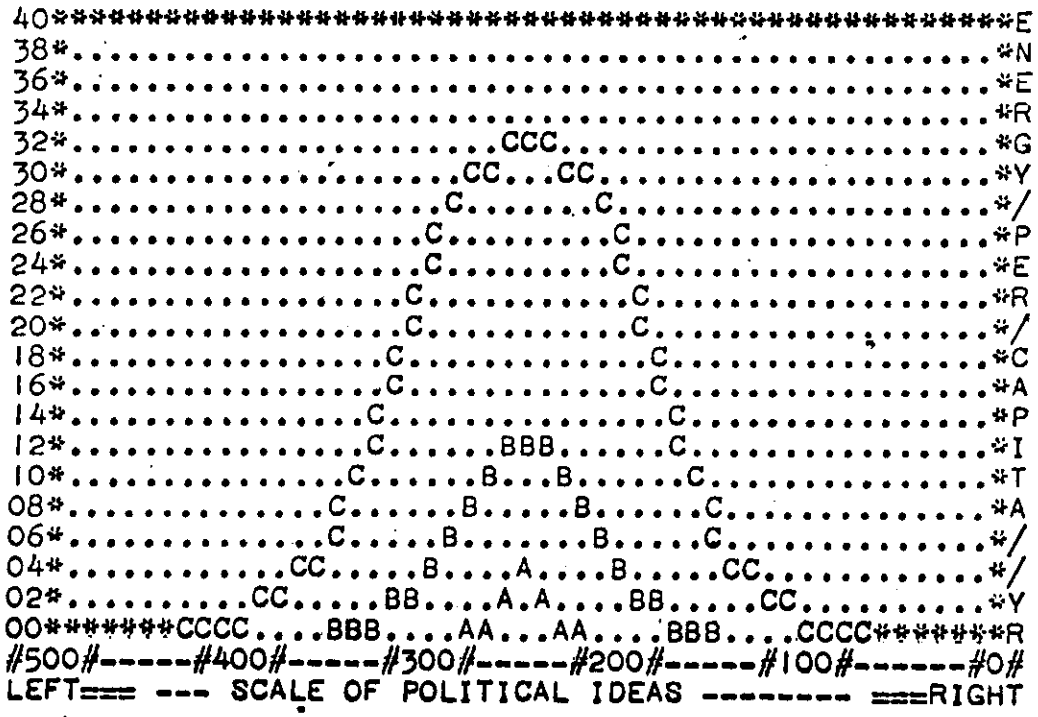
Fig. Distribution of Bulletin Board Space in Proportion to Weighted Probability Function.

This analysis is an example of using the discrete channel model from Information Theory.

For further details see Book CTCM, Section 261: The Use of Cybernetics to Solve an Employee Communication Problem

Now we will consider an example from the continuous channel model in Information Theory. **If we can define a series of political ideas or philosophies which have a similar relationship to a sociological system as a set of messages have to the telephone line over which they are sent, we might be able to apply similar formulas for the entropy of the sociological system.**

When we try this analogy for a country at three stages of its development, namely stages A, B, and C corresponding to power production of 256, 1024, and 4096 kilowatt-hours per capita per year, we obtain the three curves drawn by the letters A, B, and C respectively in the block below:



These curves show that the "modified thermodynamic imperative," when implemented with the continuous channel model predicts the above curves as optimum distributions of power among people of different political philosophies. This means that the theory predicts it is optimum for a country at the low level of 256 kwh/cap/yr(curve A) to tolerate only a small diversity in political philosophy in order to concentrate on a specific plan to industrialize the country. As the country increases its industrialization to the level of 1024 kwh/cap/yr (curve B), its tolerance of a diversity of political ideas should broaden. As the energy production increases to 4096 kwh/cap/yr(curve C),we note an even broader spread of the bell-shaped curve.

This implimentation of the "modified thermodynamic imperative" with a specific model, even though it is an analogy borrowed from electrical engineering, gives hope of providing the base for a democratic ideology that can work for a more democratic society, for Albert Schweitzer's "Reverance for Life," and for a society oriented toward a more human principle of love, instead of accepting the trend for conformity and authoritarianism observed and accepted by many of our social scientists as the wave of the future.

For further details of this approach see the following sections of the Book CTCM:

Section 2.3.2: The Thermodynamic Imperative, File 232, pp. 1-2(Mag. I/1)
Section 2.3.2A: Modification of the Thermodynamic Imperative, File 232, p. 3 (Mag. I/3-4)
Section 2.3.2B: Letters on the Therm. Imper., File 232,pp. 3-4.
Section 2.3.2C: An Example of the"Modified Thermodynamic Imperative," File 232, p. 5-8(Mag. I/3-4)
Section 2.3.3: An Application of the Continuous Channel Model to the International System of Nations, File 234, p. 1-6(II/2)
Section 2.3.4A: Continuous Channel Model(Abstract), File 234, p. 7-8
Section 2.3.4B:Democracy through a Balance between Order and Diversity, File 234, p. 9-11(Mag. II/6A)

BOOK THREE: MATHEMATICAL AND SCIENTIFIC BACKGROUND, TESTING OF HYPOTHESES -- PRIMARILY FOR THE PHILOSOPHER AND SCIENTIST. (PINK PAGES)

The incomplete state of the development of general systems theory is illustrated by the partial coverage of different parts of the universe by different candidate general systems theories in the chart below:

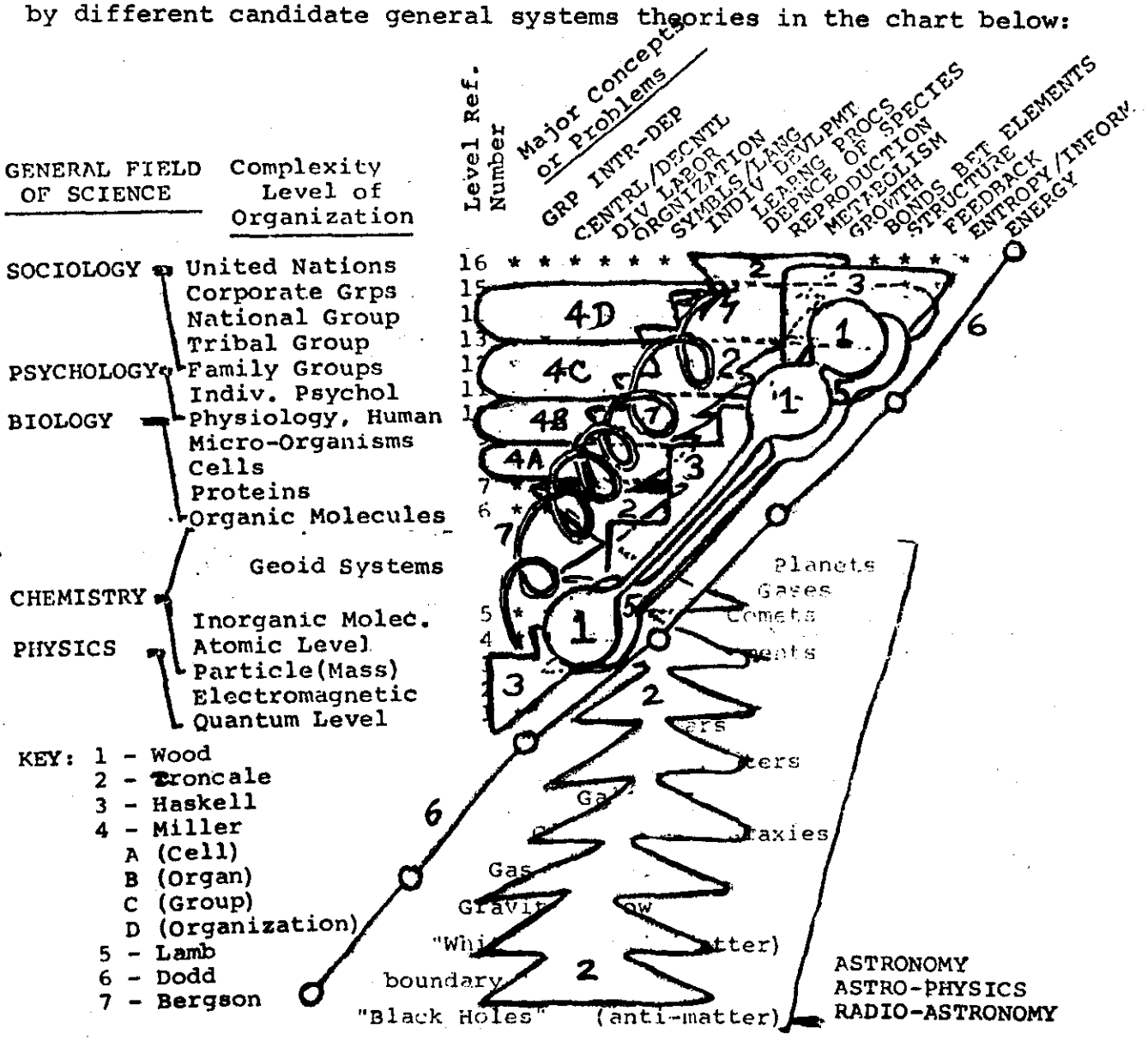


Figure - Relationships between a Number of Candidates for General Systems Theories.

p. 18 of Magazine Vol. III, No. 1
p. xivA of Book Section 100-F-21
p. 10 of SGSR Paper

COMMUNICATION THEORY in the CAUSE of MAN

After World War II, I pursued graduate study at Berkeley. I developed a special technique for studying the graduate mathematics courses needed in electrical engineering. After each lecture in mathematics, I would go for a hike in the hills to meditate about the material covered in the math lecture. I would think about the material from three viewpoints:

(1) abstract mathematic concepts;
(2) representation of engineering structures;
(3) representation of elements of biological and sociological systems.

My background of sociological information plus this triple approach to mathematics led to a process which I call "technological meditation."

While working in the computer industry on computer-communication systems, this process of "technological meditation" has led to five major spin-offs. These concepts are not claimed as new discoveries, but are perceived as forms of known principles which are easier to implement in connection with the application to real social systems:

(1) Sociological equivalent of the uncertainty principle (physics);
(2) Sociological equivalent of a completeness theorem (mathematics & general systems theory);
(3) Negative feedback systems in political and social systems equivalent to negative feedback amplifiers (electronics & cybernetics);
(4) Concept of image compression in political ideology from electrical communication channel capacity and data compression (information theory);
(5) Concept of maximizing communication entropy in social systems derived from maximizing the entropy of a set of messages on a telegraph system (information theory).

The formulation of the above principles has been defined more precisely while continuing to work on computer-communication systems in the daytime, and teaching an evening course in Cybernetic Systems.

DEFINITIONS & REFERENCES

Technological Meditation: A subconscious process of correlation between the engineering technology and systems upon which an engineer is working with the sociological system within which the engineer is working.

Refs: COMMUNICATION THEORY in the CAUSE of MAN (Abbreviated CTCM), v. I, n. 1-2, pp. 19-21, Jun-July 1970.
CTCM, v. I, n. 12, p. 6, Jun 1971.

Sociological Uncertainty Principle: There is a limit to the preciseness of observation of the evolution of a social system, similar to the limit on the observation of physical systems set by the uncertainty principle and Planck's constant.

Refs: CTCM, v. I, n. 7-8, p. 16, Jan-Feb 1971

Equivalent Completeness Theorem for Sociological Systems: Since it is not possible to formulate a quantitative completeness theorem for the mathematical representation of biological and social systems, a checking chart is proposed as a qualitative equivalent to insure minimum probability of overlooking important factors.

Refs: F. B. Wood, "The Social Responsibility of Engineers and Scientists," 1959 Proc Western Joint Computer Conf., Mar 1959, pp. 310-313.
CTCM, v. I, n. 9, Mar 1971, pp. 14-16.
CTCM, v. II, n. 1, Jul-Sep 1971, pp. 8-9.

Socio-Engineering Problems Report (SEPR) No. 402-A, Oct. 30, 1972

Negative Feedback in Social Systems: A social system in which output information is coupled back into the input in such a way to cancel part of the input in order to maintain the social system at some desired stable level of functioning.

Ref: CTCM, v. I, n. 5-6, Nov-Dec 1970, pp. 8-10.

Image Compression in Social Systems: Political ideology consists of a kind of image compression accompanied by a significant loss of information, similar to compression of facsimile or computer digital data where the loss of information prevents accurate reconstruction of the original information.

Engin. Ref: P. D. Dodd and F. B. Wood, "Image Information, Classification and Coding," 1966 IEEE Intern. Conv. Record, Part 7, pp. 60-71.

Socio Ref: CTCM, v. I, n. 1-2, Jun-July 1970; pp. 19-20.

Maximizing Communication Entropy in Social Systems: The equivalent of Shannon's discrete channel model can be used to measure the communication entropy of a social system. The higher the communication entropy (or negentropy) the more democratic the society is, provided a set of fifteen other parameters can be assumed to remain constant. More complete information on social systems can be developed by using other models such as the continuous channel model.

Refs: Conference Paper (preprint only) for First International Congress of Social Psychiatry, London, August 1964, "A General Systems Theoretic Model for the Estimation of the Negentropy of Sociological Systems through the Application of Two Isomorphic Electrical Communication Networks." (Main points have been reprinted in CTCM, v. II, nos. 1 & 2, Jul-Sep 1971 & Oct-Dec 1971)

Discussion in The Evolving Society, edited by Alice Mary Hilton, N.Y.: ICR Press, 225 East 23rd St., N.Y. 10021 (1966), pp. 227-229.

Letter to the editor, Society for Social Responsibility in Science Newsletter, No. 195, Jan 1969, 221 Rock Hill Ave., Bala Cynwyd, PA 19004. Discussion in SSRS Newsletter, No. 203, Oct-Dec 1969. Rejoinder in CTCM, v. I, n. 3-4, Aug-Sep 1970, pp. 18-22.

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