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VOL. II NO. 3

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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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REPRINT OF AUGUST 1974:

The following pages are omitted from the reprint, since revised versions are included in CTCM, Vol. II, No. 6-A, Oct-Nov-Dec 1972(Publication delayed to (9/16/73):

CTCM II/3, pp..9-10 (File No. 100-F-17, p. ii, iii)

CTCM II/3, pp..11,12,13,14,15,17,18,19,21,22
(File 100 pp.. 1, 2, 3, 4, 5, 7, 8, 9,11,12)

CTCM II/3, p. 28

NOTE ON REVISIONS AND ADDITIONS TO CTCM:

'7' in File No. 100-F-7 indicates updating to August 30, 1970.
'10' in File No. 98-F-10 indicates updating to March 28, 1971.
'14' in File No. 97-F-14 indicates updating to March 5, 1972.
'15' in File No. 97-F-15 indicates updating to June 18, 1972.
'16' in File No. 97-F-16 indicates updating to July 16, 1972
'17' in File No. 97-F-17 indicates updating to January 1, 1973

Since the Oct-Nov-Dec 1971 issue came out in July 1972, I have had a busy time. In July my wife, Betty, and I went to Washington, D.C., to participate in the wedding of our older son, Fred Bruce Wood. The wedding took place at Potomac-Appalachian Mountain Club Hostel at Harper's Ferry, West Virginia. The ceremony was a unique procedure invented by Fred and Erica, with sections composed by the two sets of parents.

While near the capital, I looked up some references at the Library of Congress, and visited the offices of a number of congressmen. I also attended a seminar put on by the Committee on Science and Human Welfare at the National Institutes of Health, Bethesda, Maryland. I also visited a number of other places such as the headquarters of the Society for General Systems Research, The Urban Institute, and Common Cause.

I returned to California in time to assist our younger son, Peter, in his departure for a four weeks course in Transcendental Meditation at Humboldt State College under the sponsorship of M.I.U. (Maharishi International University)

After starting to catch up with my computer-communications work, I received an invitation to give a seminar course evenings at California State University, San Jose. The course is a section in Cybernetic Systems 298 on "Entropy-Like Properties of Social Systems."

In September I went to the Western Regional Conference of the Society for General Systems Research in Portland, Oregon, where I presented a paper on the computation of the entropy of an international system of nations. The basic material of this paper was covered in CTCM, Vol. II, No. 2.

A number of questions came up in the discussion of my paper at Portland. Questions 19 through 23 in Section 3.9.6 of this issue, pages 25-27, are from the Portland meeting. Although I have not replied in detail to all the questions, I have at least indicated how I would go about resolving the questions. For those who don't have a copy of CTCM Vol. II, No. 2, to which the questions refer, there is a summary of the material in Section 2.3.4A, pages 23-24 of this issue of CTCM.

A by-product of my paper at Portland and the seminar at California State University, San Jose, was an invitation to present a paper at the Computer-Communications Systems Conference scheduled for the end of January 1973 in San Jose. The title of the paper will be "Sociological Spin-Off from Computer-Communications Systems Engineering."

A large part of this issue of CTCM is devoted to a revised outline of the proposed book, COMMUNICATION THEORY in the CAUSE of MAN. This outline is displayed in four columns. The first column in the main part of the outline is the section number. One can unstaple the back issues of the magazine, CTCM, and rearrange the sections in accordance with the section numbers in the outline to organize a loose-leaf cumulative version of the incomplete book.

In the outline of the book, the second column gives the section headings. The third and fourth columns are blank for sections that have not been printed. For sections that have been printed, the third column shows the section or file number, update level, and identifies the pages that have been printed to date. The fourth column indicates in which issue of CTCM the section was printed and identifies the pages.

COMMUNICATION THEORY in the CAUSE of MAN.

by

Frederick Bernard Wood, P.E., Ph.D.

To assemble a copy of the loose-leaf book, CTCM, unstaple a complete set of the magazine, CTCM, issued to date and reassemble the sections by "File Numbers," except for the magazine title pages and editorial notes. Consult CTCM, Vol.II, No. 6, Part A, Section 1.0.1 (File No. 101-F-20) for suggested way to file individual-issue title pages and irregular pages. A supplement to this issue of the magazine is available for $3.00, which includes a binder, tab-spacers, auxiliary pages, and instructions for assembling the back issues into a loose-leaf book.

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Society for Social Responsibility in Science, letter from SSRS Newsletter, No. 203, Oct-Dec 1969. (File No. 232-F-8 p. 4)

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SEPR No. 405
August 13, 1972

Abstract of:

"A Second Order Approximation to a World System of Nations Based on a Continuous Channel Model from Information Theory."

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Prepared for: (1) Presentation at the Society for General Systems Research, First Annual Meeting of the Far West Region, Portland, Oregon, September 14-15, 1972.

(2) Publication in COMMUNICATION THEORY in the CAUSE of MAN, Volume II, Number 2, Oct-Nov-Dec 1971(pub. delayed: Jul'72)

A hypothetical probability distribution of electric power versus political philosophy is used in conjunction with samples of real electric power statistics and population growth statistics to illustrate the potential for an information-theoretical continuous channel model as a framework for viewing how improved international cooperation can be developed. The basic methodology of this approach is to use an electrical communication theory model to connect a political system with a modification of Lindsay's abstract philosophical principle of the "thermodynamic imperative" in order to bring some constructive interaction between science and ethics.

This paper is organized on the assumption that for concepts to be used in the best interests of the people, rather than some vested interests, a way must be found to present material on different levels of complexity for the citizen-layman, administrator-decision-maker, and the philosopher-scientist -- all in the same document or book. This paper carries out an an experimental development of this concept by printing introductory notes on white paper, material for the citizen-layman on green paper, material for the decision-maker on yellow paper, and notes on hypotheses and sample calculations for the philosopher-scientist on pink paper.

In the introductory(white) section two hypotheses are stated: (1) there is some critical path of social evolution about which we must stay within limits or our civilization will collapse like ancient Harappa, Greece, and Rome. (2) Our situation is compounded by the possibility that a collapsing country could destroy almost all life on our planet with radiation from atomic bombs and hydrogen bombs. The most fundamental way to analyze these problems is to develop homeostatic-cybernetics feedback loop simulations of the world political-social system. In the meantime a less expensive method can give us some approximations -- namely the study of entropy-like properties of social systems.

In the general section for the citizen-layman(green section) a sub-section of general systems theory, namely cybernetics, is reviewed in a non-mathematical way to explore how a balance can be maintained between freedom and stability in social systems. First a graphical display of twenty different cybernetic models and technologies is examined to show the plausibility of finding similarities between limited properties of social systems and engineering systems such as telephone networks and radar detection systems.

Next the situation is reviewed in which we see that all over the world sensitive people are baffled,angry, resigned, or rebellious over living in a disconnected society, where they have lost the means of finding a connection between their ideals and the choices society makes available to them. Cybernetics and information theory are briefly examined in connection with R. B. Lindsay's principle of "the thermodynamic imperative," to see how use of these concepts can help connect an individual's ideals to the social and political systems that exist today.

Then an approximation to a two-nation system is discussed in which the probability distribution of electric power in a country as a function of political views is considered analogous to the probability of distribution of signal voltage on a telegraph or telephone line. If we work through the United Nations to encourage each country to modify its electric power political distribution to move closer to that distribution which maximizes the "negentropy" or "communication entropy," we see that each country, whether communist, socialist, or capitalist changes to increase the number of people in its country who can understand the outlook of people in the other country. With this system of analysis, we do not criticize a particular country for being dictatorial. Instead we compute how close the country is to its ideal "communication entropy" corresponding to its per capita electric power production.

An appendix to this section summarizes the significance of the transition we are in -- in which we are moving from the POWER ERA into the COMMUNICATION ERA.

In the section for the decision-maker(yellow pages) the equations are given for the negentropy of the continuous distribution of signal voltage on a telephone line with a given limit on the average power. Graphs are plotted to display the ideal distributions of electric power against political philosophy(units of MCD -- measure of collective direction). Then an example of two major countries is plotted to show their ideal power distribution curves and estimates of their actual curves. Then ideal and estimated actual curves are plotted for the U.S.A. for 1940, 1950, 1960, and 1970 to illustrate how the ideal curves change with per capita electric power production. The estimated discrepancies between ideal and actual curves indicates the order of magnitude of social crises to be expected in the country.

In the section for the philosopher-scientist(pink pages) the numerical parameters used in plotting the curves of the previous section are tabulated. The method of construction of the probability distribution curves is shown so that scientists and mathematicians can check the procedure. Some samples of the calculation of the "negentropy" of ideal and equivalent non-ideal probability distributions are shown to help one get a feel for the magnitude of such entorpy calculations.

A supplement to this section displays graphical representations of related phenomena such as: logarithmic spiral form of the periodic table of the chemical elements; bio-social evolution spiral; phenomena-methods-stages coordinate system; private/public bulletin board space proportional to communication entropy of membership statistics; process of technological meditation; modified thermodynamic imperative; maximizing negentropy for degree of internal systems democracy; maximizing negentropy for optimum balance of order and diversity; and testing of hypotheses on a systems properties versus phenomena levels chart. (These items are described in earlier issues of the magazine - COMMUNICATION THEORY in the CAUSE of MAN.)

Questions No. 1 thru 12 are listed in CTCM Vol. I, No. 12.

Questions No. 13 thru 18 are listed in CTCM Vol. II, No. 1.

Question 19: In reference to the curves of ideal and estimated electric power distribution as a function of political ideology in CTCM II/2, pp. 10, 13, 15, 16, 17, & 21, should not the U.S.A., by the hypotheses of this paper, have been better off in 1930 to have had an electric power distribution like the U.S.S.R. has in 1972? L.C.

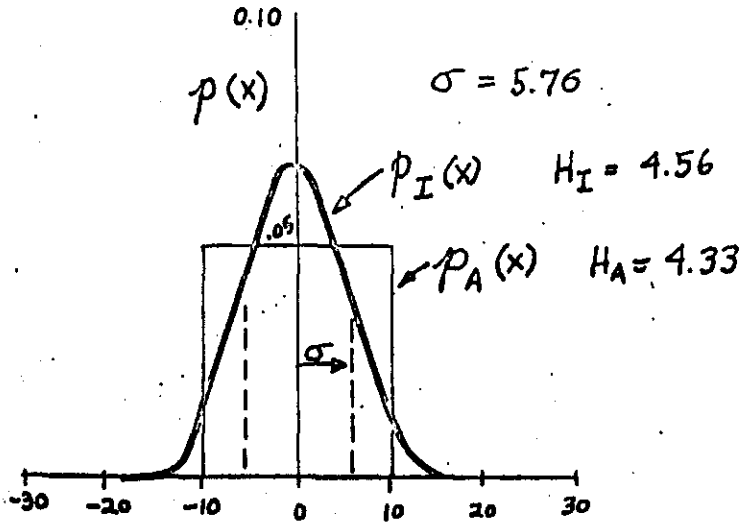
To give a simple answer to this question, I would have to assume the other fourteen parameters I discussed in CTCM I/1-2, pp. 27-28(File No. 330-F-5) remained constant. I would prefer to first take some more elementary cases involving only six or seven other parameters to illustrate the method, before I go into detail on how to tackle this question. I have an elementary example prepared for use in the seminar, Cybernetic Systems 298 at California State University, San Jose. I aim to include some of this material in the next issue of CTCM.

Question 20: In reference to the ideal and non-ideal curves in CTCM II/2 p. 20, do not the hypotheses upon which they are based lead to a proof that a one-party system is better? Is this then a contradiction with your aims to support democratic institutions? F.H.

The analysis presented in CTCM II/2 gives the total ideal distribution of power versus political ideology(MCD). To examine the distribution of power by political parties, we have to use another model in addition to this one. If we use the discrete channel model used in CTCM II/1, pp. 13-20 (File No. 233-F-15, pp. 1-8), we find that two or possibly three major political parties increases the communication entropy in model II/1 without seriously decreasing the communication entropy of model II/2. Both models are approximations which give us insights which the other model doesn't account for.

A sample iteration is started as follows:

First, consider the continuous channel model (II/2), CTCM II/2 p. 20, Fig 5(a):



We see that the ideal communication entropy for this case is H_I: 4.56 and the model doesn't indicate how the power should be distributed among organized groups.

Next we look at Model II/1, CTCM II/1, p. 7 (File 111-F-15, p. 7):

If one political party dominates to exercise 99.9% control, the communication entropy is

0.113,

while, if there is no organization, i.e., 100,000 individuals with no organization, the communication entropy is

16.61.

For a two-party system, we would have:

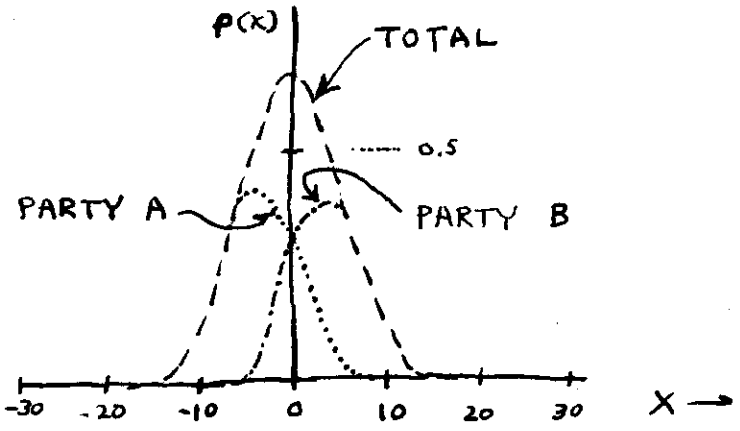
$2\ (1/2) \log_2 1/2 \ : \ 1$

For a four-party system, we would have:

$4\ (1/4)\ \log_2 1/4 \ : \ 2$

Values for other numbers of political parties can be computed with the use of the table and curves of CTCM I/12, pp. 9-10 (File 341, pp. 1-2).

Now having learned from Model II/1 that at least a two party system is indicated, we can construct two ideal political party distributions that add up to the ideal distribution of Model II/2:



There are conditions of very low power production per capita where the variance is so small that breaking the distribution into two parties may not cover much difference in political ideology. Therefore under such conditions Model II/2 may indicate a temporary stage of development where a one party system may be more efficient.

The important features of the two models are that Model II/1 indicates a

preference for a multi-party system, while Model II/2 indicates that after a certain threshold of development of electric power, that the distribution of power versus political ideology must be broadened, either by breaking the single political party into more than one, or by some other guarantee of individual rights.

Question 21: How do you account for the agricultural sector of the economy with the model presented in CTCM Vol. II, No. 2?

The continuous channel model from electrical communication theory, when applied to a set of nations only takes into account certain factors directly related to the transition from the Power Era to the Communication Era. It does not deal with the agricultural sector. Other mathematical concepts related to Cybernetics do relate to the role of the agricultural sector. For example the input-output matrices and related Leontiev matrices described in items 11 through 16 in the figure labelled "A Snapshot Of Cybernetic Models & Technologies," do take into account all sectors of the economy, including the agricultural sector. (The figure is on page 5 of CTCM II/2, File 116-F-16, p. 1)

Question 22: Does the continuous channel model as presented in CTCM II/2 take into account the possibility that the exponential rise of electric power generating capacity in the last forty years may have to stop on account of environmental problems?

The model by itself as applied here has been structured on the assumption of a continued rise in world power production. To take into account the limits of growth set by the environment, we will have to consider all the columns, rows, and diagonals in the half-matrix discussed in CTCM Vol. I, No. 1-2, p. 28(File 330).

Question 23: In reference to plots of power distribution for the U.S.A. on page 17 of CTCM II/2, should not the center points of the curves shift slightly to left for each decade from 1940 to 1950 to 1960 to 1970 ?

B.B.

Yes, a shifting to the left with the years would be more accurate.