

SOCIO-ENGINEERING PROBLEMS NO. 20-A*

A series of manuscripts on the social relations of engineering and related philosophical questions dealing with the interaction of science and society. Distribution is limited to reviewers and discussion groups for criticism prior to consideration for possible publication.

Frederick B. Wood, Ph.D., P. O. Box 85, Campbell, California
July 21, 1962

AN EVALUATION OF SOME APPROACHES
TO THE SOCIAL RESPONSIBILITY OF
ENGINEERS

The editor of the Proceedings of the Institute of Radio Engineers asked for comments, thoughts, and observations on the desperate need for intimate understanding and mutual cooperation between "the two cultures" of C. P. Snow(1). In the June 1962 issue, Lawrence Fleming in discussing the two cultures, says: "The third and most important question is how free is the engineer to speak at all? Nearly all scien-

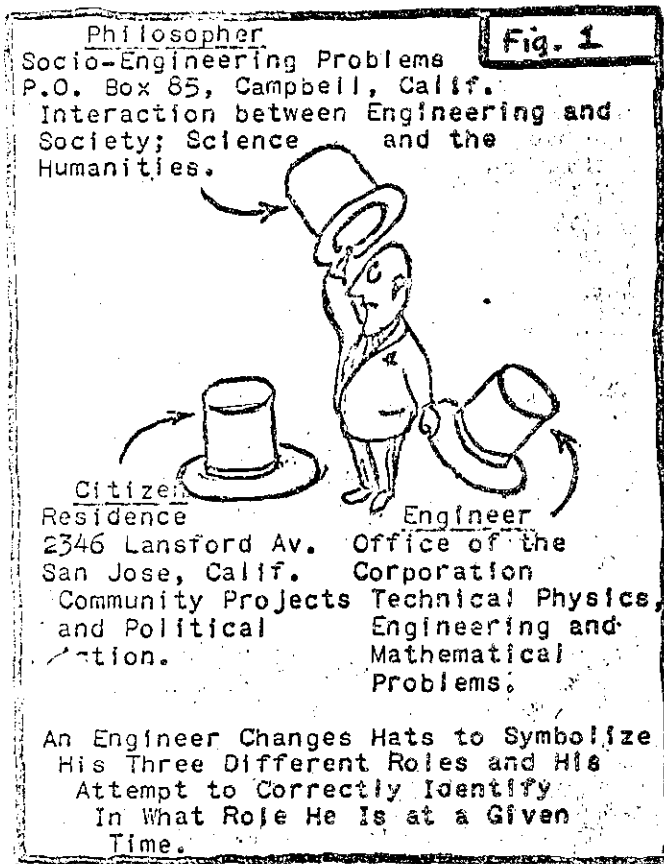
tists and engineers are full-time salaried employees of organizations, and are restricted from communication in about the same way military officers."(2)

I have found that the restrictions on freedom of speech of engineers are nowhere near as severe as is implied by Mr. Fleming. By operating in accordance with the rules of the National Society of Professional Engineers in regard to the engineers' duty to the public welfare, and his responsibility to protect his employer's interests, I was able to present a paper on the social responsibility of engineers at the 1959 Western Joint Computer Conference.(3) At the oral presentation of the paper, a cartoon similar to the one on the left was quite useful in making it clear that I was speaking as an individual citizen, not as a representative of the corporation. At that time I had two hats, now I have three as shown in the cartoon on the left in Fig. 1.

A more complete analysis of these questions was developed by Canning and Sission by abstracting my 1959 WJCC paper and combining the material with a paper by N. J. Dean of Booz, Allen & Hamilton.(4)

1. T.F.J. "The Two Cultures." Proc. I.R.E., vol. 50, No. 2, Feb 1962, p. 129.
2. "Discussion of the Two Cultures," Proc. I.R.E., vol. 50, No. 6, Part I, June 1962, pp. 1547-51.
3. F. B. Wood, "The Social Responsibility of Engineers and Scientists." 1959 Proc. WJCC, March 1959, pp. 310-313.

* Supersedes SEP No. 20(2/16/61-6/9/61), "A Checklist..."



My method of preparing the social responsibility paper was to collect some old notes of mine written during the period 1940-1947 as a byproduct of various discussions I had had in church groups. Then I selected some of the more appropriate material and prepared a series of notes called "Socio-Engineering Problems." The function of these notes was to provide a limited distribution of the ideas for discussion prior to editing for submission to established journals and engineering societies.

At this time I am reviewing the scope, history, usefulness, and general comments received in regard to this series. For each issue, I am listing the number, dates of conception or first draft followed by issue or revision date, then title or topic, and then an abstract of the text, and then notes on significant comments and criticism.

SEP No. 1, Aug 1958 (8/28/40-8/30/58), "THE NATURE OF THE SOCIAL RESPONSIBILITY OF ENGINEERS." Fig. 2 on the right is reproduced from this issue. This diagram does not solve any problem, but serves to focus attention upon the related problems of social responsibility and need for a synthesis of the special fields of science and the humanities. It is a start in approaching the problem which E. M. Lignon calls "logic-tight compartments," a process by which many people who call themselves "Christians" avoid applying the ethics of their religion to their daily lives.(5)

4. "Direction and Control of Technological Change." Data Processing Digest, Canning & Sission and Associates, 1140 South Robertson Blvd., Los Angeles 35, Calif. vol. 7, No. 2, Feb 1961, pp. 18-20.

Ernest M. Lignon, The Psychology of Christian Personality. N.Y.: Macmillan Co. (1937), pp. 146-151.

"The engineer may be regarded, therefore, as an interpreter of science in terms of human needs and a designer of men, tools, and materials in satisfying those needs." - from E.C.C.D. The notion of "human needs" raises any sociological questions.

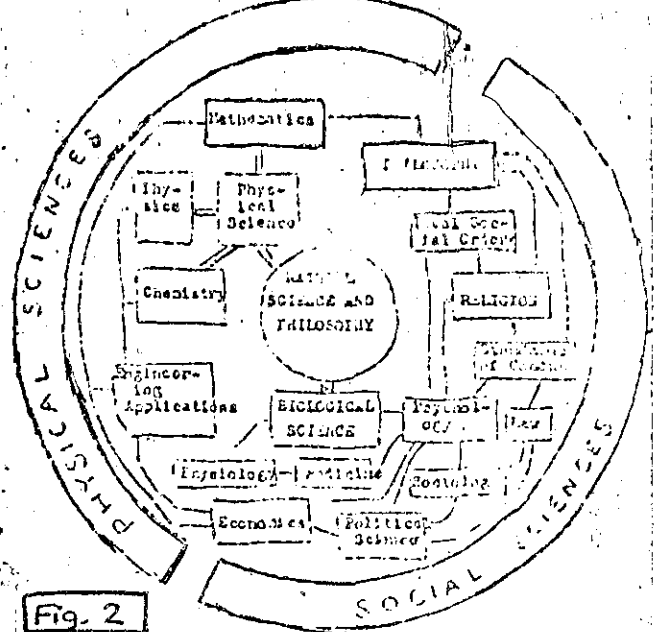


Fig. 2

A preliminary attempt to organize a synthesis of the specialized fields of science to assist the engineer in developing an interpretation of science in terms of human needs.

This problem was also brought to my attention by an editorial in the Journal of Applied Physics of October 1940: "Archibald MacLeish (6) has made a declaration and a challenge. He accuses physicists and scholars in all fields of having divided learning into narrow cubicles; each particular scholar being conscientious, laborious, competent and supreme in his own little section but absolutely disinterested in the society or the culture that has made his bit of freedom possible or in his responsibility for its continuation....." (7).

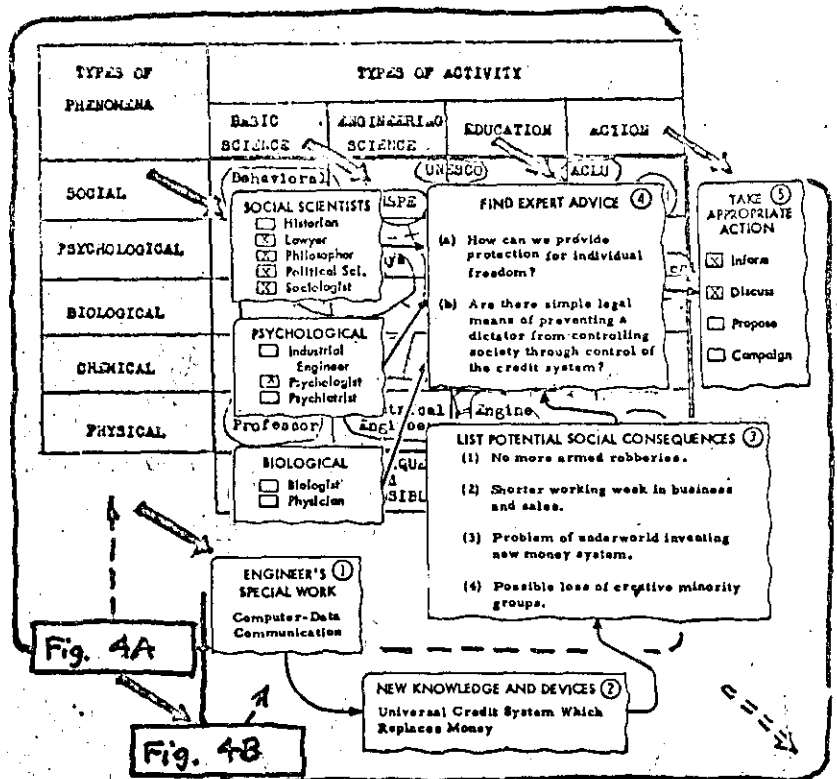
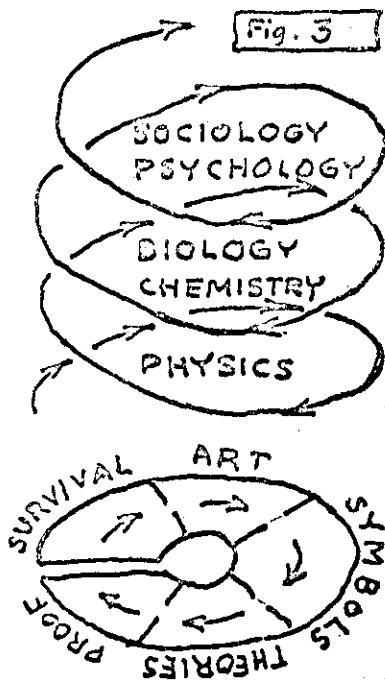
During World War II the American people responded to the challenge of the Nazis, Fascists, and Japanese Militarists who were attacking the common elements of Western culture upon which our tradition of freedom and goals of democracy are based.

6. Archibald MacLeish, The Irresponsibles. N.Y.: Duell, Stone and Pearce (1940)
7. "The Irresponsibles," Journal Applied Physics, vol. 11, no. 10, Oct 1940, p. 625.

Our scientists responded with enthusiasm by working on various military projects to give the Allies the needed weapons to beat the Axis Powers. In the time of crisis the intellectual: both scientists and humanist scholars cooperated for the common goal of freedom. When I had days off and vacation time during my work on radar development during World War II, I sometimes wondered about what the situation would be after the War. Would the specialist be able to cooperate in working for common human goals, or would Archibald MacLeish's criticism be applicable again? I jotted down some of my thoughts in notebooks which saved for future use. Fig. 3 (SEP No. 1, Fig 3) illustrates the trend of some of my notes of that period. The circle and spiral show how as society evolves, people concentrate on problems in the approximate order of:

SURVIVAL-ART-SYMBOLS-THEORIES-PROOF. The spiral is symbolic of the repeated cycling through these stages in regard to different levels of natural phenomena.

I found it difficult to find people interested and competent to review these ideas locally, so I mimeographed SEP No. 1 and sent copies to various university and government research departments for comments. Professor Dame Kathleen Lonsdale, F.R.S. University College London, suggested that F. Creedy and Prof. W. Taylor Thom, Jr., might be interested. Mr. F. Creedy suggested that a goal such as "To produce noble and happy human beings" is needed in order to coordinate the various activities I included in my notes. He also brought attention to the philosophy developed in his book The Next Step in Civilization.(8) Dr. Thom's ideas on these



problems are published in the first publication of the World Academy of Art and Science.(9) Through contacts in the Society for General Systems Research I found that Sr. Walter Dupouy of Caracas, Venezuela, had developed a diagram similar to my Fig. 3 and Dr. Rafael Rodriguez Delgado of Caracas had a table organized similar to my checking chart of Fig 4A.(10) Lord Boyd Orr, who is now the President of the World Academy of Art and Science, wrote "Best wishes for your success in getting engineers interested in the great problems of our age."

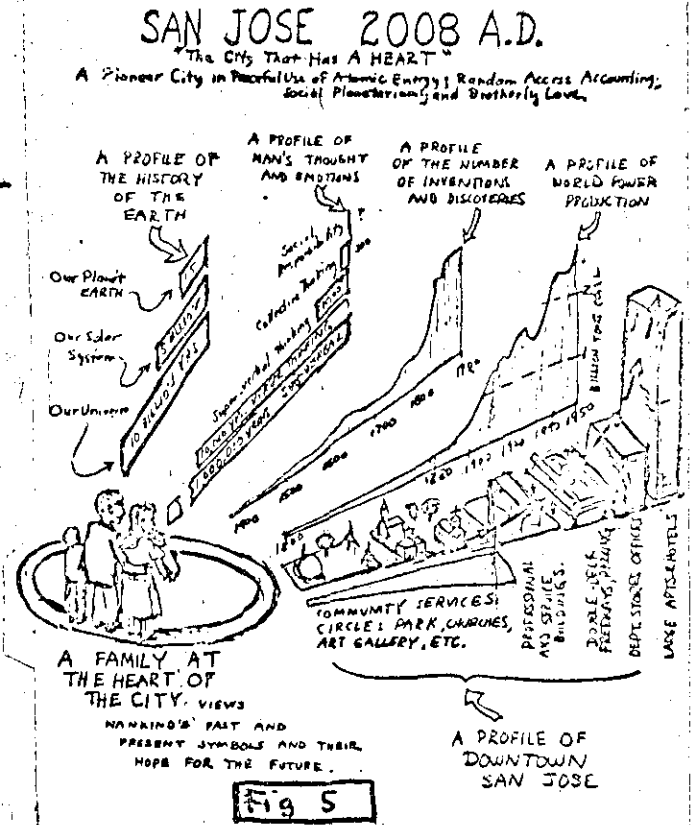
Fig 4 illustrates the transformation from the checking chart for assisting an engineer in developing contacts and understanding of the relationship of his work to society (Fig 4A) to a checking chart for tracing the possible social consequences of a particular project (Fig 4B).

In the first version of the social responsibility paper (SEP No. 1), I included reference to religion in the diagrams and by way of a quote from THINK Magazine.(11) The manuscript was too large for use at the 1959 computer conference and the sections on religion were left out. After the paper was published Canning, Sisson and Associates suggested that professional and lay religious leaders be added to the list of consultants in Fig 4B.(4) During the writing of these

notes I received many valuable comments from priests, ministers, and rabbis.

II. Editorial "Common Ideal" THINK Magazine, October 1952.

SEP No. 2 Sept 1958(9/30/57-11/12/58)
"SAN JOSE 2008 A.D.(Sociology-Fiction)"



8. F. Creedy, The Next Step in Civilization. Toronto: The Ryerson Press(1955).
9. W. Taylor Thom, Jr., "Science and Engineering--and the Future of Man" pp. 247-300 in World Academy of Art and Science, Publication No.1, edited by Hugo Boyko, Science and the Future of Mankind, The Hague, The Netherlands: Dr. W. Junk Publishers(1961)
10. Revista de SINTESIS, Tomo I, Caracas, Julio-Setiembre 1954, Walter Dupouy, "Era Atomica, Era de Sintesis" pp. 13-23; Rafael Rodriguez Delgado, "Esquema del nuevo pensamiento(Hacia un nuevo organo filosofico)"pp.25-48.

The above Fig 5 illustrates the philosophy of applying concepts of historical perspective and information theory together with the idea of developing ways of helping man remain close to nature eventhough he is highly organized into a complex industrial society. This note gives some clues as to how we might remain human and maintain democratic institutions in an era where the previous protections of private property have been attenuated by the encroachment of large corporations and government institutions.*

*See T. K. Quinn, "The Individual in a Business Society" The New York Society for Ethical Culture(1953)

The remaining issues of Socio-Engineering Problems are listed out of numerical sequence in order to follow a more logical sequence.

SEP No. 13-A*(1/10/47-5/8/62) "THE DILEMMA OF SPECIALIZATION: FUTURE PERSPECTIVE" (6&11 pp.).

Fig 6 illustrates the problem of specialization, leaving inadequate coverage of the major problems of our age while engineers and scientists attempting to cover the total problems are in danger of diluting their effort.

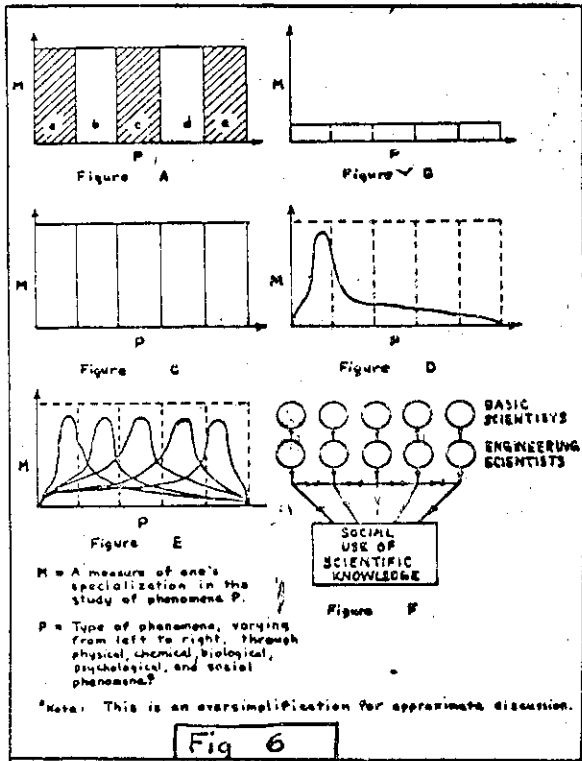


Fig 6

The required breakthrough across the narrow fields of specialization will not come by the exhortation of religious leaders or by the challenge of great humanists like Archibald MacLeish. Conceptual advances which permit bridging the gaps of specialization must be founded upon the discovery of related phenomena in different fields or phenomena on different levels of organization which have common form such as the negative feedback circuits of CYBERNETICS and the concept of channel capacity of INFORMA-

TION THEORY. The potential value of Cybernetics and Information Theory is indicated as a goal in Fig 7.

SEP No. 3 Oct-Dec 1958(1/23/57-2/12/58) "FEEDBACK CIRCUITS IN COMPUTERS AND SOCIETY"(18&v pp.)

This note is a first step in showing how a start can be made in bridging the gap of specialization through the concept of negative feedback in cybernetics.

More recently Margaret Mead has circulated an extended abstract of a paper suggesting "a restatement of the Soviet and the American socio-economic-political systems in cybernetic terms" in order to enhance the possibilities of fruitful communication between the U.S.S.R. and the U.S.A.(12)

SEP No. 5 Apr-Jun 1959(12/13/57-7/3/59) "THE UNITED NATIONS, INFORMATION THEORY, CYBERNETICS, AND DECISION THEORY"(15&B&11 pp.)

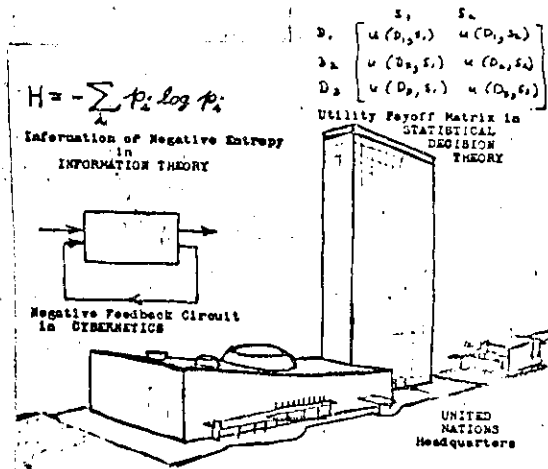


Fig 7

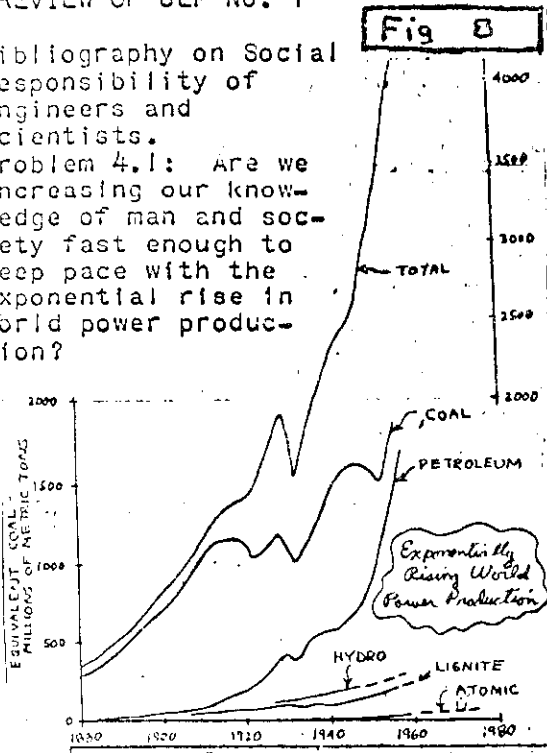
The role of Statistical Decision Theory here is to assist people in recognizing all the significant factors, which is more important than obtaining a numerical answer that might be wrong due to erroneous assumptions.

12. Note in ITEMS, Nov 1961, Soc. for General Systems Research, 787n United Nations Plaza, New York 17, N.Y.

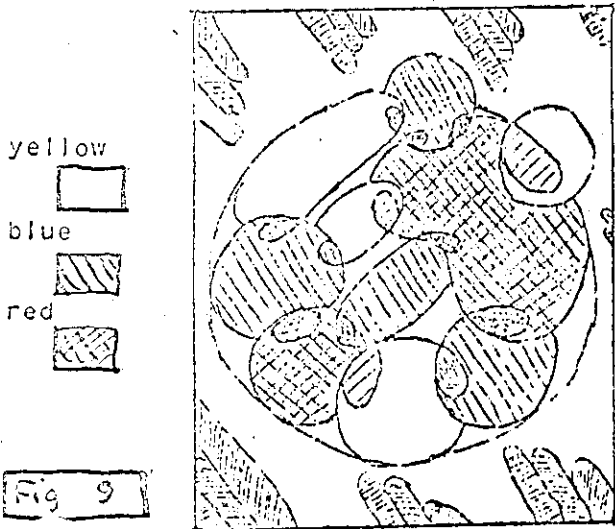
SEP No. 4 Jan-Mar 1959 (4/26/59)
 "REVIEW OF SEP No. 1"

Bibliography on Social Responsibility of Engineers and Scientists.

Problem 4.1: Are we increasing our knowledge of man and society fast enough to keep pace with the exponential rise in world power production?

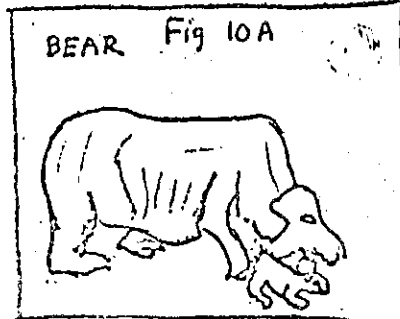


SEP No. 6 July 1959 (10/1/59)
 "ART AND SCIENCE, WHY A WORKING PAPER DRAFT, LIST OF PROBLEMS, AND INDEX"



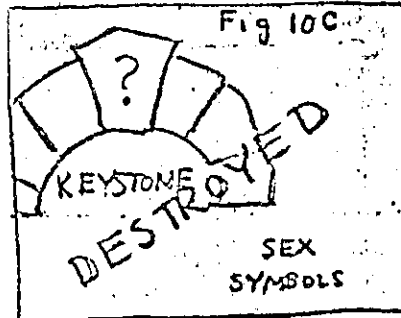
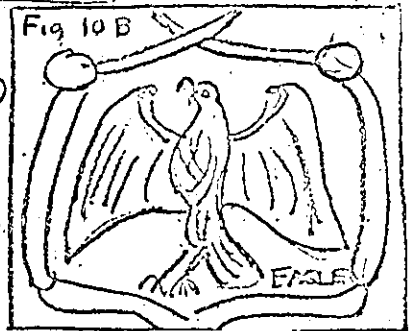
A Man and Computer Struggling to Cope with the Problems of an Increasingly Complex Society.

SEP No. 18-B(7/7/57-6/31/62) "THE LOST SYMBOLS AND THE NO-OSPHERE"



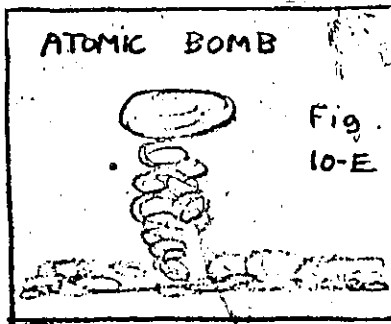
As we pass into a new epoch of the geological history of the earth--- man needs a new

perspective. Through the "lost symbols," (13) the ethical teachings of the church became real and personal to the individual. What will be the symbols of the new era



that will link the myths man believes with the great creative potentialities of this new epoch? Will the symbol of the era be an Elvis Presley, a Davy

Crockett, or an Albert Schweitzer? Or will man create some new symbol? Will the power of atomic and hydrogen bombs be the symbol of the age? Or will it be the



control of Cybernetics?
 13. Rev. John Harrell, "The Lost Symbols," filmstrip, Chicago: Soc. for Visual Education.

SEP No. 7 Aug 1959(8/11/59)
"PROBLEMS TO BE REFERRED TO THE
SOCIETY FOR GENERAL SYSTEMS RESEARCH"

Notes on goals; free parallel thinking in respect to interdisciplinary research; definition of general systems theory; and problem of distribution of preliminary hypotheses. Includes a sample of distribution of space in a public building to religious groups on the basis of the negative entropy of the membership statistics and some social and psychological feedback loop analogies.

SEP No. 8 Sep-Dec 1959(5/2/60)
"WHAT IS THERE ABOUT SOME OF MY ARTICLES WHICH MAKE THEM DIFFICULT FOR PEOPLE TO UNDERSTAND?"

Word-frequency distribution for SEP No. 1 and comparison with Zipf and Mandelbrot distributions. Analysis of sentence structure and choice of words using the criteria given by Fiesch.(14)

14. Rudolf Fiesch, The Art of Readable Writing, N.Y.: Harper and Bros.(1949), p. 213 and inside covers.

SEP Nos. 9-A & 10-A (11/25/46-3/13/62) PARTS I & II of "PARTIAL DERIVATIVES OF HISTORY"

Introduction-J.C.Maxwell on analysis vs. synthesis; J.G.Crowther on the Royal Society; and "partial histories of different orders."
Fifth order partial history of the Universe
Fourth order partial history of the Earth
Third order partial history of Man
Second order partial history of Science
First order partial history of Physical Science.

SEP No. 11-A (5/26/47-4/2/62) "THE HISTORY OF ELECTROMAGNETIC THEORY." Abstract (9&111 pp.)

Introduction; Perspective; Outline of the History of Electricity and Magnetism; Basic History of Electromagnetic Theory; Application of Electromagnetic Theory; Application to Microwave Wave Guide Transmission;

Future Perspective; Supplementary Discussion; and Selected Bibliography.

SEP No. 12-A (1/10/47-5/7/62)
"HISTORICAL PERSPECTIVE: SOME NOTES ON THE RELATIONSHIP BETWEEN ENGINEERING, SCIENCE, AND SOCIETY"

The engineer and human needs; distribution of emphasis in SEP No. 11-A; occurrence of events of the universe important to mankind, the geological era of the earth, and the development of mammals; and development of man and the development of man's thinking.

SEP Nos. 14-A & 15-A (5/21/47-5/11/62) "EXAMPLE OF USE OF CHECKING CHART, PART I: CHECKING CHART, HISTORICAL PERSPECTIVE AND WORLD POWER PRODUCTION; PART II: TIME SCALE OF ATOMIC ENERGY DEVELOPMENT, ESTIMATING PRIMARY PILE LOCATIONS, SECONDARY PILE LOCATIONS, ATOMIC DEVELOPMENT AUTHORITY."

SEP No. 16-A (8/13/56-3/12/62)
"PROBLEMS OF THE RIGIDITY OF CLASSICAL DISCIPLINES AND OF SPECIALIZATION"

The need for developing cooperation between different fields of specialization in science and engineering is discussed and the following approaches are briefly reviewed:
(1) Development of "engineering scientists."
(2) Encyclopaedic co-operation.
(3) Relationship -- cyclical changes and trends.
(4) Common philosophy.
(5) Common elements & form.
(6) Transfer of technique from one field to another.

SEP No. 17-A (4/11/57-6/19/62)
"COMMUNICATION THEORY IN PERSPECTIVE"

The problem of communication and control is the central problem of contemporary society. The concentration of the philosopher upon precision of measurement and precision of definition, although essential for scientific progress, tends to neglect human feelings, so that we can lose our humanity. The three levels of communication theory: namely, the technical, the semantic, and the

effective must all be developed to maximize the negentropy of human civilization. The confusion between "myths," "facts," and "truth" must be properly understood.

CYBERNATION: THE SILENT CONQUEST

A recent report to the Center for Study of Democratic Institutions by Dr. Donald N. Michael indicates a serious possibility of the failure of democratic institutions to survive the full impact of cybernetics and automation. I feel that his warnings are

valid, if we fail to do something about them. However the developing of teaching machines, the possibility of Dr. Lasswell's "social planetaria" and studies of the social order such as those made by F. Creedy show us the potential tools which can be used to make Dr. Michael's predictions fail.

OUTLINE OF A PROPOSED BOOK ON "COMMUNICATION THEORY In The Cause Of MAN"

Since returning from some engineering work in Europe in the summer of 1961, my thoughts spontaneously regrouped into an outline of a proposed book as follows: The aim of this proposed book is to bring to the educated layman who is interested in peace and freedom, a grasp of the theoretical tools of engineering and science that might be useful analogies in developing projects for peace and freedom. The objective is to meet the challenge of the NOOSPHERE (Vernadsky) without the 'ALIENATION' of Pappenheim, Fromm, and Marx through expediting the "UNITARY PRINCIPLE" of L.L. Whyte, through utilization of the analogies of CYBERNETICS (and Information Theory) as foreseen by Wiener, and extended by Deutsch, without waiting for the present generation to die [Max Planck], and further salvaging the synthetic concepts of Comte and Lester Ward as a guide to the process of transition to the third stage of Rosenstock-Huëssy: [1] truth is divine and has been divinely revealed (Anslem), [2] truth is pure and can be scientifically represented (Descartes), and [3] truth is vital and must be socially represented (Rosenstock-Huëssy).

PART I: INTRODUCTION

1. Introduction. Diagrams based upon checking chart.
2. State of Western Civilization. Wisdom of Confucius; Ten Commandments of Moses; and Teachings of Jesus. Philosophy and Sociology of August Comte; Philosophical and Economic Theories of Karl Marx; and Sociology of Lester Ward. Freud; Jung; and Adler. 'Out of Revolution' E. Rosenstock-Huëssy; Notebooks of Simone Weil; and 'Alienation of Modern Man' F. Pappenheim. The Noosphere of Teilhard de Chardin; and Biogeochemistry of Vernadsky. 'Accent on Form' L.L. Whyte; and 'May Man Prevail' E. Fromm.

PART II: PROBLEMS OF SPECIALIZATION AND IRRESPONSIBILITY

3. The Dilemma of Specialization.
4. A Checking Chart.
5. Partial Derivatives of History.
6. Example of Checking Chart.
7. Special Responsibility of Engineers.

PART III: INFORMATION THEORY AND ENGINEERING SOCIOLOGY

8. Channel Capacity.
9. Ideology as a Coding Problem.
10. Distribution of Negentropy in Political Organization.*
11. Balance of Obligation and Rights--Organization and Freedom.

PART IV: CYBERNETICS AND GENERAL SYSTEMS THEORY

12. Feedback Loops.
13. Capitalist and Socialist Systems.
14. Social Planetaria.
15. Computing as a Tool for Democracy.
16. Computer-Data Communication Systems and Economic Systems.

PART V: HUMAN VALUES AND ANALOGIES OF COMMUNICATION THEORY

7. Potentials of fruitful contact between competing economic and political systems.
18. Conservation of Human Values: Information Theory provides principles and bounds; Cybernetics the form of institution to carry out the goals.
19. Summary: The Unitary Principle--The Next Development of Man.

* Ideas for this section outlined in SEP No. 19-A(2/18/57-1/4/62)

SOCIO-ENGINEERING PROBLEMS NO. 20-B

A series of manuscripts on the social relations of engineering and related philosophical questions dealing with the interaction of science and society. Distribution is limited to reviewers and discussion groups for criticism prior to consideration for possible publication.

Frederick B. Wood, Ph.D.

~~P. O. Box 85~~ Campbell, California

October 5, 1962

"The Two Cultures and the Social Responsibility of Engineers"

In the February 1962 issue of the Proceedings of the Institute of Radio Engineers the editor¹ asked for comments, thoughts, and observations on the desperate need for intimate understanding and mutual cooperation between "the two cultures" of C. P. Snow.² It is encouraging to see the seven letters³ and the article by Gerald Holton⁴ in the June issue. Some relevant work on this problem was started in the spring of 1958 by a few engineers in San Jose, California. After some informal discussions a public panel discussion on "The Social Responsibility of Engineers" was sponsored by the local chapter of the California Society of Professional Engineers in which a philosophy professor and two engineers discussed the question. Some of the material was written up for the Western Joint Computer Conference.⁵

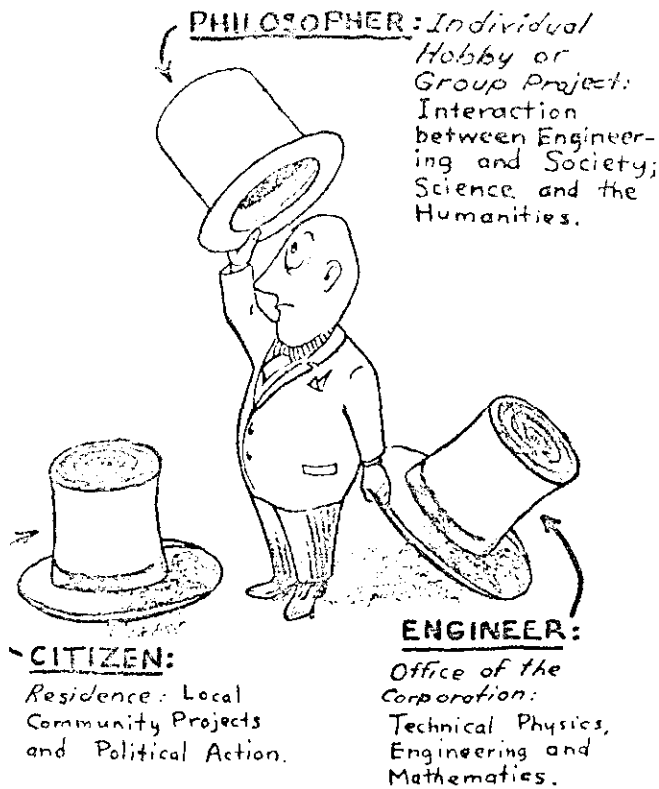
During the review of the WJCC paper, discussions were held on the question of whether an engineer could speak as an individual without implying that his philosophical views represented the policy of the corporation. The question was resolved for the oral presentation by use of a slide similar to Fig. 1, showing the author changing hats to speak as an individual citizen, not as an engineer representing the company.

The philosophical concepts discussed in the August 1958 panel discussion and the specific example used in the 1959 WJCC paper are illustrated in Fig. 2. First the vertical coordinate is based upon levels of phenomena like the founders of Sociology: Auguste Comte, Herbert Spencer, and Lester Ward⁶ used in classifying the sciences. The

most fundamental phenomenon-physical - is placed at the base, with the others on top in order of complexity. The horizontal scale is divided into sections by class of activity: starting from basic science on the left and moving through applied science or engineering to education to decision and action. The resultant rectangular block is shown with a break, roughly corresponding to the gap between the "Two Cultures" of C. P. Snow. The front section is the domain of the physical and mathematical sciences. The back section represents the domain of the humanities.

Now the consideration of the social responsibility of an engineer for his own work can lead to a small thread across the gap. To illustrate this the "checking chart" from the 1959 WJCC paper has been superimposed upon the face of the science classification block. Information for one special case has been filled in on the chart as an example. For more details on the following five steps one can refer to the original paper⁵ or to the review and extension issued by Canning and Sisson.⁷ The engineer considers:

- (1) His special work: computer-data communication,
- (2) The potential new system resulting, such as a universal credit system replacing money,
- (3) The possible social consequences,
- (4) What are the real problems remaining after seeking expert advice, and
- (5) What level of action is required?



g.1. An Engineer Changes Hats to Symbolize His Three Different Roles and His Attempt to Correctly Identify in What Role He Is at a Given Time.

The wavy-line arrows from the social phenomenon level of the humanities section to the checking chart symbolize how the engineer in the process of this analysis has woven two threads across the gap through his consulting with a philosopher and a lawyer. There are two ways known by which this process can be extended: one by many engineers making small threads across the gap by reviewing their own work in this manner, and second a more powerful approach lies on the horizon, namely the extended use of analogies from cybernetics and information theory to bridge the gap between the humanities and the sciences and to bridge the gaps between the special fields within science.

It is becoming more important for the United States to explore these approaches, because philosophers and scientists in Europe and the Soviet Union are developing reports and books claiming that using cybernetics to attack religion,⁸ claiming that cybernetics is an example of dialectical

materialism,⁹ and announcing a program to produce a three volume works on "Cybernetics At The Service of Communism".¹⁰ It is very important that the United States develop the capability of evaluating these claims, so that false claims can be refuted, and valid claims can be assimilated in a way to protect individual freedom. Soviet propoganda could omit analogies from information theory which conflict with concepts like "the dictatorship of the proletariat," while using other analogies to influence world opinion by distorted applications of cybernetics.

Comments and criticism of the approach use in this letter would be appreciated by the author since further studies are being planned.

Frederick B. Wood
 Socio-Engineering Problems
 P. O. Box 85,
 Campbell, Calif.

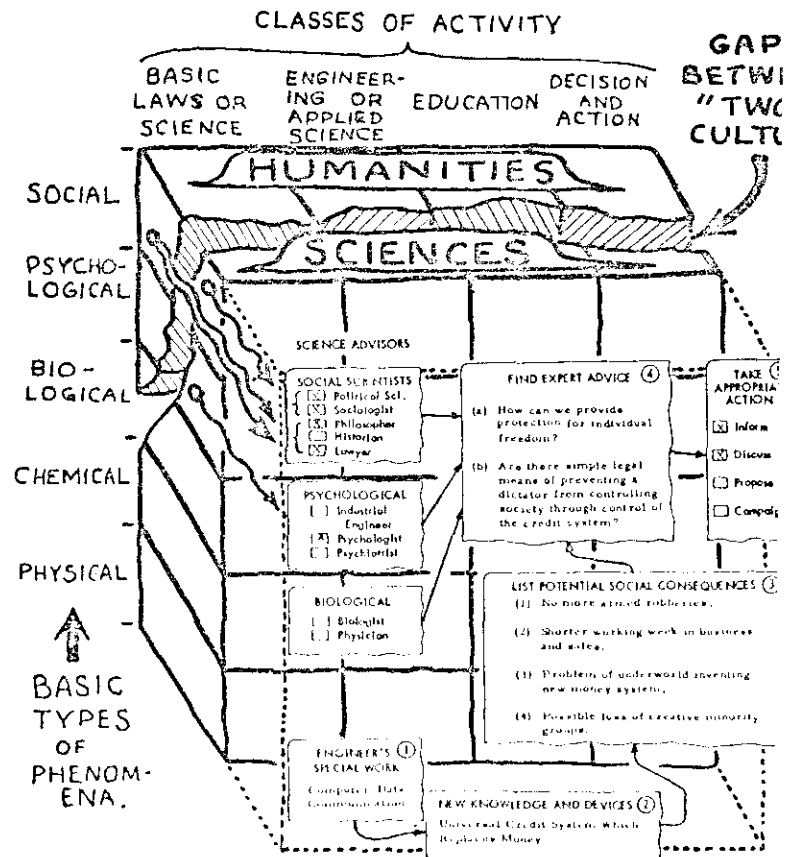


Fig. 2. A Checking Chart Superimposed Upon A Classification System For The Sciences And The Humanities.

References

1. T.F.J., "The Two Cultures," Proc. I.R.E., vol. 50, p. 129; February, 1962.
2. C. P. Snow, "The Two Cultures and The Scientific Revolution," Cambridge University Press, New York; 1961.
3. "Discussion of The Two Cultures," Proc. I.R.E. (Correspondence), vol. 50, pp. 1547-1551; June, 1962.
4. Gerald Holton, "Modern Science and the Intellectual Tradition," Proc. I.R.E., vol. 50, pp. 1452-1458; June, 1962.
5. F. B. Wood, "The Social Responsibility of Engineers and Scientists," 1959 Proc. Western Joint Computer Conference, pp. 310-313; March, 1959.
6. Samuel Chugerman, "Lester F. Ward, The American Aristotle," Duke University Press, Durham, North Carolina; 1939, pp. 88-91.
7. "Direction and Control of Technological Change," Data Processing Digest, Canning, Sisson and Associates, Inc., Los Angeles 35, California, vol. 7, no. 2, pp. 18-22; February, 1961.
8. I. P. Gutkin and K. E. Morozov, "Cybernetics Attacks Religion," Report JPRS-6655, Selected Translations from Nauka i Religiya (Science and Religion) - USSR, 30 Jan 1961, U. S. Joint Publication Research Service, Washington 25, D.C., pp. 1-5.
9. Georg Klaus, "Relationship of Causality and Teleology from the Cybernetic Viewpoint," trans. from Deutsche Zeitschrift fur Philosophie, West Germany, vol. 8, pp. 1266-1277, 1960; Report JPRS-8374, June 1961 (Abstract in Technical Translations, Washington 25, D.C., vol. 8, p. 306, Aug. 15, 1962).
10. A. I. Berg, editor, "Cybernetics At The Service of Communism-USSR," trans. of Vol. I of book; Report JPRS: 14593, 25 July 1962, 435pp., Joint Publication Research Service, Washington 25, D.C.

POSTSCRIPT ON CLASSES OF LETTERS AND REPORTS

(Socio-Engineering Problems Report No. 20-C)

- P. S. I classify the letter and/or report to which this note is attached as a "philosophical" communication. I attempt to fit each letter or article I write into one of the three categories listed below:
- (a) Engineering Technical Communication: Articles dealing directly with the engineering work of the corporation for which I work are processed through the Publication Department of the corporation in accordance with Section 14 of "Canons of Ethics" (*) of the National Society of Professional Engineers. Such communications dealing with technical work and cleared by the corporation would be issued from my engineering business address: Advanced Systems Development Division, International Business Machines Corporation, Monterey and Cottle Roads, San Jose, California, 95114.
 - (b) Philosophical Communications: Philosophical studies dealing with the interrelationship between science and society; the sciences and the humanities are issued solely upon my own responsibility without review by the corporation. Such communications are issued from the address of Socio-Engineering Problems Reports: P. O. Box 85, Campbell, California, 95008, and are edited to clearly have no identification with the corporation.
 - (c) Community, Political and Religious Communications: Material dealing with local community problems or representing a particular political or religious viewpoint are issued from my residence address: 2346 Lansford Avenue, San Jose 25, California, 95125.

Frederick B. Wood

*"Professional Policies" National Society of Professional Engineers, Washington, D. C. (1958), p. 48.

10/22/63, Revised 12/3/63

"An Experiment In How An 'Individual In A Business Society(?)'
Can Become 'An Interpreter Of Science In Terms Of Human Needs(*)'."

Ref. 3: T.K. Quinn,
former Vice-President
General Electric Co.
The Individual
In A Business
Society," The
New York Soc.
For Ethical Culture(1958)

SOCIOLOGICAL SYSTEMS

Set of m human freedoms with probabilities (G_j)

Negentropy or measure

of Democracy:

$$D = - \sum_{j=1}^m G_j \log G_j$$

(Generalized form of this type
of analysis is being written for book:
"Communication Theory in the Cause of Man")

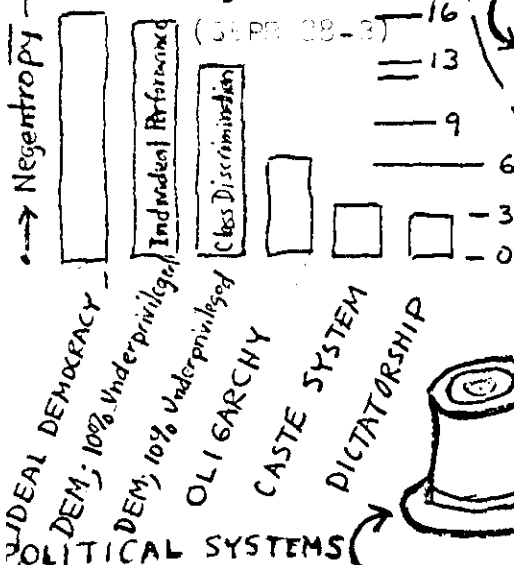
PHILOSOPHER: Individual Hobby or
Group Project: Interaction
between Engineering and
Society: Science and
Humanities.

Socio-Engineering Problems
P.O. Box 85, Campbell
California 95008

(SEP 20-8)

TRANSFER BY ANALOGY (SEPR 65-0)

Application to
question of need
for civil rights
legislation:



POLITICAL SYSTEMS
Ref. 4: Engineers'
Council For Prof-
essional Develop-
ment, "Engineering
As A Career," N.Y.
(1942), p. 6.

CITIZEN:
Residence:
Local Community
Projects and
Political Action.
2346 Lansford Av.
San Jose, Calif.
95125

ENGINEER: Office
of the Corporation:
Technical Physics,
Engineering, and
Mathematics.

Los Gatos Systems Laboratory
IBM Corp., P.O. Box 66
Los Gatos, Calif. 95031

TELEGRAPH SYSTEMS

(& Computer Communication
Systems)

Set of n messages or ins-
tructions with probabili-
ties (p_i) of being sent.

Negentropy or measure of
information, (#)

$$H = - \sum_{i=1}^n p_i \log p_i$$

Most of the time while wearing my engineer's hat, I write computer programs and design computer communication devices, using the basic equations from that part of electrical engineering and mathematical statistics called "Information Theory." Then some evenings and weekends I put on my philosopher's hat and consider what analogies are valid applications of the same equations from Information Theory in the analysis of sociological systems. Then on some weekends I put on my citizen's hat and attempt to make practical application of the same equations to specific political problems.

Ref. 4: Leon Brillouin,
Science and Information
Theory, N.Y.: Academic
Press(1956), 2nd ed.(1962)

Note: This combination of
separation of roles with
crossing of boundaries by
analogy is useful in breaking
open the "logic-tight compartments"
deplored by Ligon in Psychology of Christian Personality(1937).

Thus I see a certain fundamental unity in
life and our knowledge of nature. I foresee science
and technology forcing mankind to make the trans-
ition from the "power age" to the "information age"
where man can more truly find Albert Schweitzer's
"Reverence for Life" closer at hand.

Frederick B. Wood 12/15/63
Rev. 3/14/64

The quotations herein are the two introductory paragraphs of a four-page article of this title in Data Processing Digest, a publication of Manning, Arnold, and Associates, Inc., 1180 Santa Monica Blvd., Los Angeles 24, Calif., Vol. 7, no. 2, Feb. 1961 (13¢ per copy), pp. 15-18.

The yearning written covers which have come to our attention discuss aspects of a social problem that will become increasingly urgent in solution. The problem concerns the direction of our nation's technological progress. The first of these is the "social responsibility" of the scientist, which is being defined by the National Science Foundation as the obligation of the scientist to use his knowledge for the benefit of the whole society, and to avoid the use of his knowledge for the benefit of a few individuals or groups. The second is the "social responsibility" of the engineer, which is being defined by the American Society of Civil Engineers as the obligation of the engineer to use his knowledge for the benefit of the whole society, and to avoid the use of his knowledge for the benefit of a few individuals or groups.

The second paragraph also digresses to the "responsibility" of the concerned citizen, who is urged to "contact his representatives in Congress, and urge them to take the proper steps to control it properly. The central theme of the article is the "social responsibility" of the scientist, which is being defined by the National Science Foundation as the obligation of the scientist to use his knowledge for the benefit of the whole society, and to avoid the use of his knowledge for the benefit of a few individuals or groups. Such a responsibility imposed upon scientists and technologists is the obligation to work with other professionals in channeling technological advances into areas of greatest benefit to man, consistent with the highest moral principles. To believe there is a parallel here to the development of atomic energy, except that the "destructive" power of automatic information systems is much less apparent, and perhaps therefore, even more insidious."

A Vision of Our Automatic Future

Neal J. Dean, Editor, Allen Hamilton, Chicago, Illinois
Paper presented at 2nd National Conference on Electronic Computation, American Society of Civil Engineers, Sept., 1960

A limited number of copies of the paper are available from the authors, Neal J. Dean, Editor, Allen Hamilton, Chicago, Illinois

Allen Hamilton, Editor, Allen Hamilton, Chicago, Illinois
Paper presented at 2nd National Conference on Electronic Computation, American Society of Civil Engineers, Sept., 1960

Copies of the paper, 1960, are available from the Editor, Neal J. Dean, Editor, Allen Hamilton, Chicago, Illinois. A limited number of copies of the paper can be obtained from the Institute for Social Responsibility in Science, 1180 Santa Monica Blvd., Los Angeles 24, California.