

Stage B
of R to T.

SEPR No. 189
June 20, 1968

"Duality in Physics, Information Theory,
Computer Science, and Philosophy, & Sociology"

by

Fredrick B. Wood

My motivation for this note is to test a hypothesis on why I have encountered certain contradictions in the corporation for which I work as an engineer. This corporation has policies which pay special attention to the rights of each individual employee. Yet on a number of occasions the corporation has objected to action on my part which I thought were essential to my obligations as a citizen and were consistent with Company policies. Back in 1957 the corporation management stated that company policy required their review by experts of my proposed speeches, but that they could not find any experts, so therefore I couldn't speak. After months of negotiation a compromise was evolved. In 1964 the corporation management objected to me accepting the invitation of a Jesuit Priest to speak at conference on computers and society where I would not be identified with the corporation and I would be attending during my vacation time. The corporation claimed that the press might find out that I worked for

21

the corporation. This ^{by the corporation} attempt to deny my rights as a citizen and ~~to~~ the attempt by the corporation to interfere with the activities of a religious organization made me angry. Although one high level manager in the corporation suggested that, if I persisted in thinking about sociological problems I should look for a job elsewhere, I decided to stay in the corporation, because I was learning that ^{this} contradiction was a symptom of some more general phenomenon in American industrial organization that I might be in a strategic spot to diagnose. Since the corporation management urged me to agree ~~not~~ to stop ~~staying~~ talking about problems of social responsibility I stopped such talk within the corporation and limited my discussions of sociological problems to scientific, political, and religious organization since 1965.

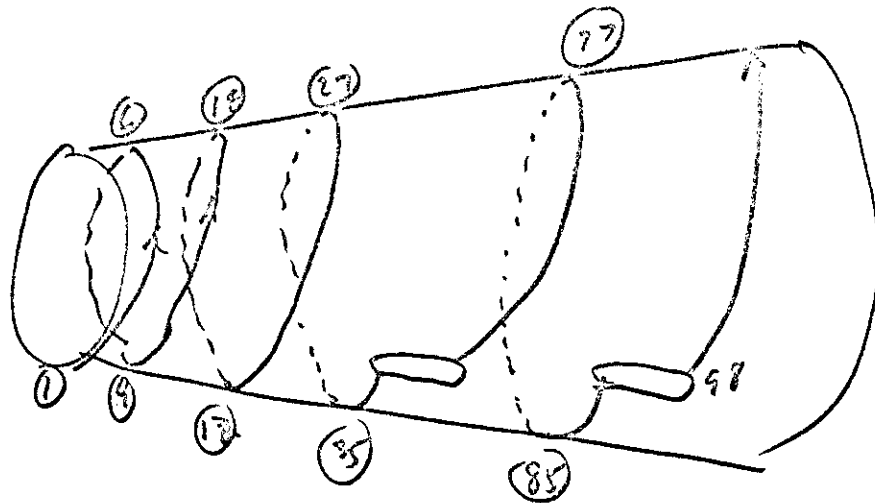
I remembered the historian Arnold Toynbee had developed a theory of how civilization rise and fall and that he perceived a certain sequence of stages. I began to wonder whether this contradiction in the corporation for which I worked might be a symptom of some change in phase of our civilization. I remember

~~sequence~~ series of civilizations analyzed by Toynbee - our civilization is the first to have the capability of understanding social evolution and therefore the first civilization with the knowledge that could permit our civilization to make an evolutionary change instead of dying.

On evenings and weekends I pursued the study of these sociological problems with the main cooperation coming from The Society for General System Research and Section L on The History and Philosophy of Science of the American Association for the Advancement of Science. Even in this area I encountered opposition from corporate management on some issues.

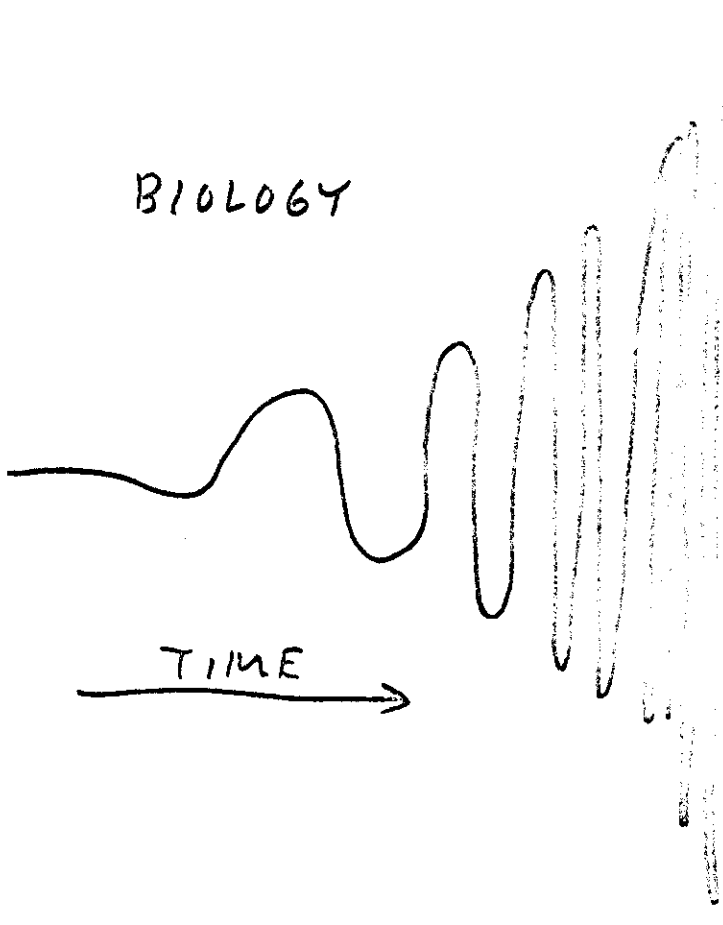
I found that some popular misconceptions of how hypotheses are tested in science persisted even in engineering management circles in the Corporation. I found it necessary to look deeper into the history of science and also into many non-corporatist segments of our society where I might find people who looked at problems with different perspectives. I found significantly different perspectives in MENSA, Unitarian Adult Classes, and the M.I.T. permissive Free University, and some students in a Democratic Society.

My discussions with these groups helped me isolate some more significant relationships in science. These people reminded me that the periodic table of the elements in chemistry can be put in a spiral form:

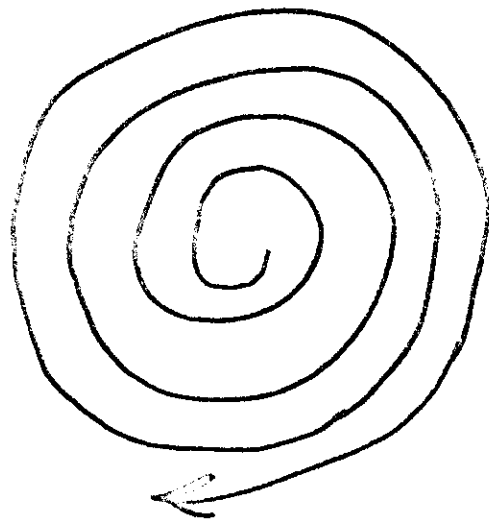


CHEMISTRY

BIOLOGY

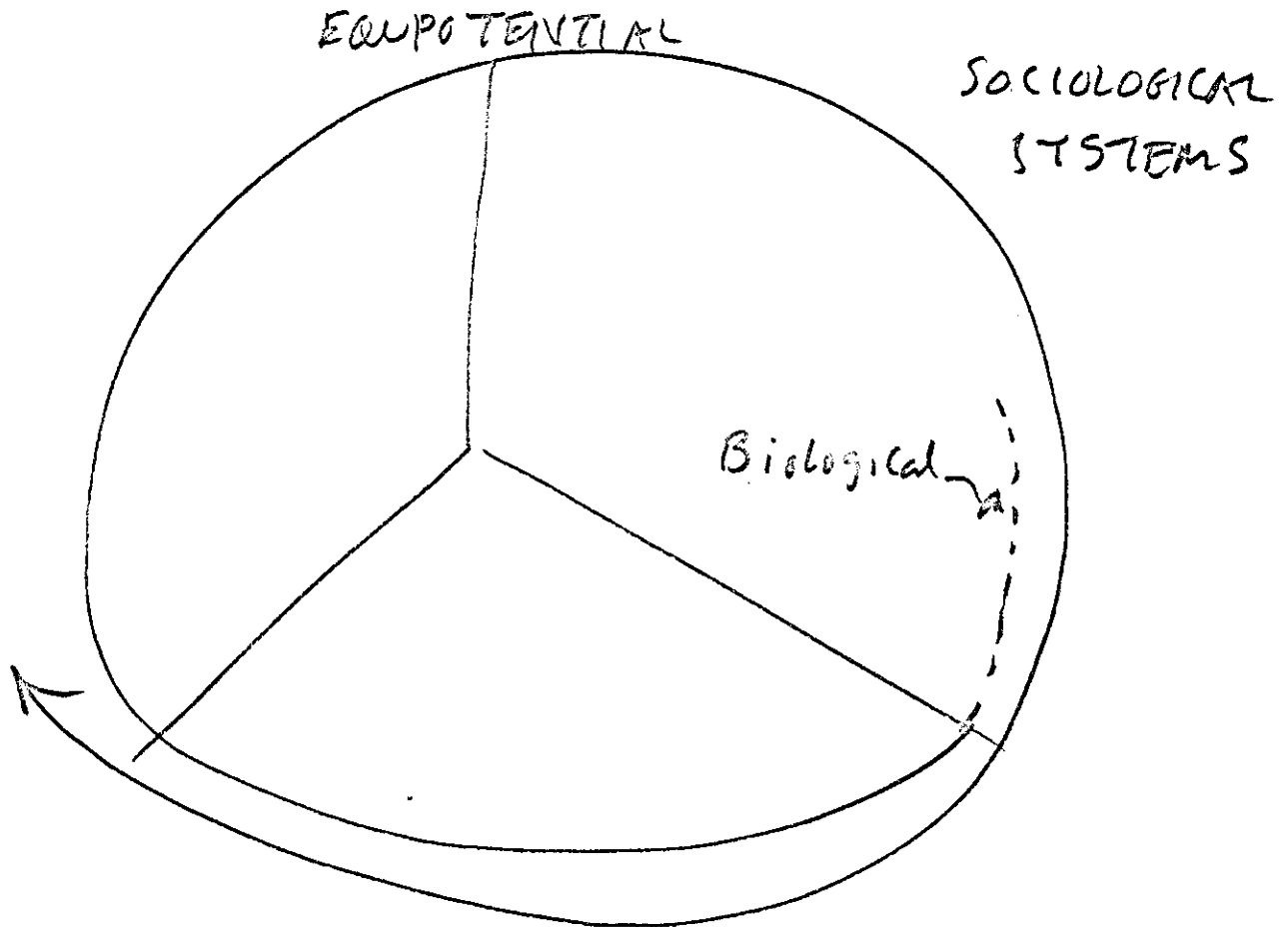


EQUIPOTENTIAL



MOSAIC

Also some pointed out there is a similar
Social form in biology. Then one man
pointed out that the BIOLOGICAL SOCIAL
may extend on to social evolution.



MOSAIC

The current phenomenon of hippies, student
rebellion, riots in the U.S., rigidity in
the technocratic structure of large corporations can be
perceived in a simpler way by use of the coordinate
system from BIOLOGY.

The phenomenon of the middle class withdrawing from politics to a "conformist" type of political activity is symptomatic of the well developed MOSKIC structure. The "hippies" are blindly trying to advance (or retreat in some cases) to an EQUIPOTENTIAL state. The students are angry at the highly structured MOSKIC state. The Blacks find themselves being pushed backwards from the lower steps of the MOSKIC stage, and don't want to go back to ~~the~~ either the natural jungle or the artificial jungle (GHETTO).

Now there exists only help us perceive what is happening. To perceive how these groups in our civilization and how grosser segments such as America, USSR, Red China can cooperate in pushing civilization through the next transition in social evolution, we need an appropriate communication model. As in physics we look at electrons in some circumstances as particles and other as waves we have a duality of concepts

Physics	discrete	continuous
	Particles	Waves

Fortunately Shannon in his mathematical theory of electrical communication developed the framework for discrete channels and continuous channels

Information theory	discrete	continuous
	DISCRETE	CONTINUOUS

Social System \Rightarrow Useful for internal degree of democracy Useful for degree of dynamic justice
 -- a balance between diversity and stability

In the field of computer science we have discrete and continuous systems known as "digital" and "analog"

COMPUTERS	discrete	continuous
	DIGITAL	ANALOG
Most computers work in digital		
	C'SM on Digital	

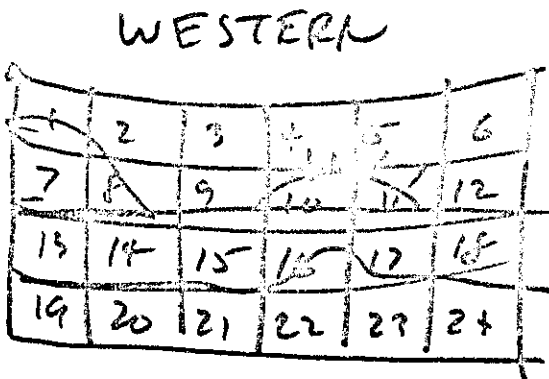
There have been papers in mathematics in recent years illustrating this.

Math Set Theory	discrete	continuous
	Bounded Sets	Fractal Sets

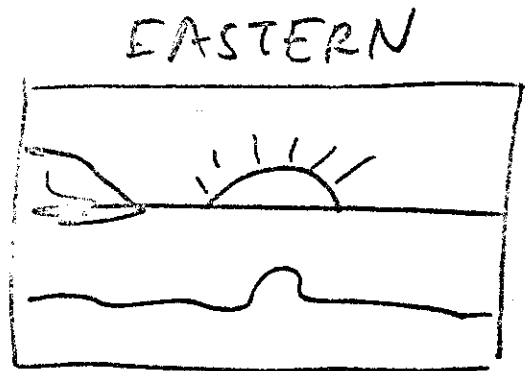
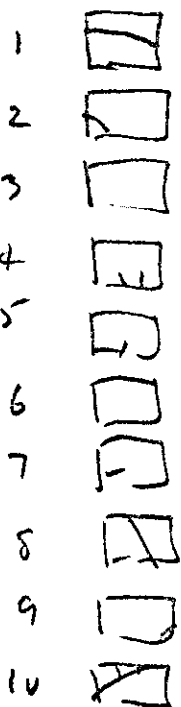
Now in photography I found a discussion with Alan Watts quite illuminating:

Philosophy	objects	contents
	WEST	EAST
	DISCRETE	GOOEY

Fish net



1, 2, 3, 4, ..., 24



SKY, ISLAND, SUN
OCEAN, BEACH

SKY



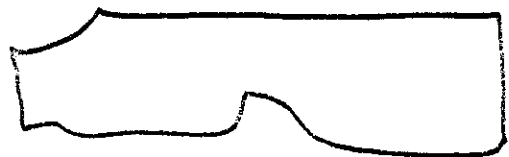
ISLAND



SUN



OCEAN



BEACH



Now a related contrast between EAST and WEST is the relative emphasis on probabilistic vs deterministic approach.

Decision Making	WEST	EAST
IF FULL FACTS KNOWN	Use Facts	Use Facts
IF INSUFFICIENT FACTS KNOWN	Use deterministic logical rules with what facts are known.	Use probabilistic coin tossing to select most likely readings to guide decisions.
	Decision theory [Bayes law, etc]	<u>I Ching</u>

There is an interesting convergence in the computation of physical constants that has not yet been verified

PHYSICAL CONSTANTS	WESTERN SCIENCE	EASTERN PHILOSOPHY
	Design precise (discrete) experiments to measure.	EPICOSM MODELS All possible combinations, permutation, etc with logical restraints

With this understanding that there are two approaches to looking at many phenomena, I realize that the corporate management is generally constrained to the discrete outlook in science, engineering, computers, philosophy, sociology, etc. While I have been advocating the continuous channel model in information theory as the most significant for the survival of our civilization.

Now for practical purposes it is easier to get things done in the digital way (or discrete way) so the solution is to use continuous channel model conceptually and approximate it with a discrete channel model (or CSM system) for practical simulation.

The logical explanation of the inconsistencies of corporate policy and practice, I think, can be explained in terms of the corporate manager being trained almost entirely in discrete model systems, do not perceive the total reality that requires both the discrete and continuous aspects to fully understand. Further it has taken me a long time to perceive the nature of this communication.

The understanding of this reality from a photo system recipient can help our civilization understand the crisis which might otherwise terminate our civilization. Perhaps I should be thankful that certain corporate warreagers did ~~would~~ ~~would~~ ~~would~~ me and made me angry so I would look for other perspectives leading to a ~~potential~~ ~~potential~~ ~~potential~~ solution of the problem of our civilization.

Fredrick B. Word

P.O. Box 5095

San Jose, Calif 95150

Some historical notes are given in Appendix A
Further details are also given in SEPR No. 160-A
(6/14/68) 12 pp.

Appendix A. Historical Notes on Social Responsibility of Engineers in Industry.

In the Spring of 1958 it took considerable arguing with corporate management to get permission to go to the Spring Joint Computer Conference to hear a symposium on the Social Problem of Automation. In fact I only obtained permission after I announced I was taking part of my vacation that week and ordered a plane reservation which I paid for personally.

When I prepared a paper on social responsibility for the Spring 1959 Computer Conference it took many months of arguing with corporate management to get approval. Back in 1958, when in doubt about the meaning of company rules and policies, I would ask my manager for an interpretation.

Some types of questions resulted in stalling rather than answers, so I found that I had to take action and then inquire if there were any better ways to get answers. Later I compared getting interpretations of company rules to taking transformer the way an engineer finds the electrical characteristics of an unknown transformer is to make open-circuit tests and short-circuit tests from which he can calculate the basic parameters of the transformer.

represented the open-circuit test. I had to figure out how to apply the equivalent of the short-circuit test, so that the results of the two tests would permit calculation of the basic parameters of the system. The nearest approximation to the short-circuit test is writing a letter to the president of the corporation or to the chairman of the board.

In ~~November~~ 1964 I was invited by a Jesuit Priest to speak at a symposium on cybernetics and society. I felt that it was important for church religious and educational leaders, and citizens to discuss such topics so our country could be better prepared to deal with the three problems of civil rights, automation, and war which were converging toward more complex and difficult problems in the next few years (after 1964). There were other problems at that time which seemed to interfere with corporate management's perception of the situation. I did try the short-circuit method of writing a letter to the chairman of the board of Directors. The results did not yield information like the short-circuit test, but produced a response more akin to applying an impulse function to an unknown circuit, ^{and trying} to interpret the results in terms of Laplace transformation theory.

There was no indication that the letter got to the chairman of the board. However the sum of the responses from corporate public relations, education speech writing; division management, personnel, and public relations; and laboratory management, personnel, and public relations, although separately addressed to different fragments of the problem added up to a confirmation of the hypothesis I stated in the letter.

This hypothesis was "the policy of the corporation appears to be to try to make engineers irresponsible toward their community and country." This hypothesis was confirmed by the objections of corporation ^{which on occasion} management to my speaking as an individual, not identified with the corporation, at a Jesuit organized conference of corporations and society. After the conference I learned that the Center for the Study of Democratic Institutions, Santa Barbara, Calif., had studied the impact of corporations on the U.S. and had found that the upper middle class and professional people associated with corporations had more or less withdrawn from "producer" type political activity. Their studies have indicated a deterioration of democratic procedures under this passing of upper middle class and professional peoples political activity away from "producer" type toward "consumer" type.

In December 1964 I agreed with local management to desist from trying to get the corporation interested in the social consequences of engineering work. As a citizen I did not give up my responsibility as discussed in SSR 5 pamphlet No. 6, but switched emphasis towards analyzing the more general processes in our society.

In 1965 Prof David Easton, Univ of Chicago, published A Systems Analysis of Political Life in which he defined the principle types of cybernetic feedback loops in political systems. He found two major classes: support feedback loops which are countable in terms of number of votes or letters of support or opposition; and demand feedback loops describe problems, often in ambiguous language, that require translation and/or conversion into specific issues. I noticed that the "demand" feedback loop related somewhat to "producer" political activity, and that the "support" feedback loop related more closely to the "consumer" political activity.

In 1967 Galbraith published The New Industrial State. Studying Galbraith led to my seeing the significance of the conversion of most political activity to "consumer" type by the impact of the technostance of the developing large corporation. In 1967 and 1968 Brian Beegon gave some lectures on a periodic table of biological systems, in which he represented biological systems in a table.

SOCIO-ENGINEERING PROBLEMS REPORT No. 189

Date: 6/20/68

Sty: B

SEPR 189 (11 pp)
APP. A (5 pp)

FREDERICK B. WOOD
P. O. BOX 5095
SAN JOSE, CALIF. 95150

"Duality in Several Fields from
Physics thru Information Theory
to Sociology." *

by

Frederick B. Wood

Abstract

Some problems of respect for the rights of the individual citizen working for a large corporation are examined. Why do some individuals in a corporation with explicit rules respecting individual rights still have problems?

It is postulated that a duality similar to the duality in physics, where an electron is considered as a particle in some circumstances, and as a wave in other circumstances, is the key to solving this question. This table illustrates the range of fields exhibiting some duality:

<u>Field</u>	<u>Dual Concepts</u>	
	<u>Discrete</u>	<u>Continuous</u>
PHYSICS	Particles	Waves
COMMUNICATION CHANNELS	Discrete	Continuous
COMPUTERS	Digital	Analog
MATH. SETS	Bounded Sets	Fuzzy Sets
PHILOSOPHY	Western Discrete	Eastern Gooey
DECISION MAKING	Causal	Probabilistic
BIOLOGICAL SYSTEMS	Mosaic	Equipotential
SOCIOLOGICAL SYSTEMS	Mosaic	Equipotential

The hypothesis is proposed that when major segments of world civilization are in advanced stages of the power era, nearing a transition point for entering the communication era, that both of the dual aspects of philosophy, and also of all technological fields are necessary to perceive an adequate perspective of the problems of human civilization.

It is further postulated that the reason some individuals have conflict with corporation management is that corporation management is oriented toward the western tradition of discrete halves of such dual pairs of view are relevant to their problems, while the individuals in conflict have put emphasis on the missing elements of the continuous halves of the dual pairs. Since the technostucture of modern industry was made possible by early development of discrete systems, the system almost unconsciously deals only in discrete aspects of their systems.

In my 1964 London paper I included both discrete and continuous channel models, and observed that the discrete model appeared useful for analyzing an isolated social system, while the analysis of a social system in contact with other social systems required the continuous model to measure its stability.

Frederick B. Wood
P.O. Box 5055
San Jose, Calif. 95150

SOCIO-ENGINEERING PROBLEMS REPORT No. 189-A

Date: 6/20/68 6/21/68
Stage: SEPR 189 Abstract
 B SEPR 189A