USING THE PHILOSOPHY OF GST TO INTEGRATE THE DATA ON CARBON-DIOXIDE BUILDUP IMPACT ON GLACIATION

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ABSTRACT

A two dimensional table of major world problems is developed based on Platt's scales of grade of problem and time to go critical. From this table a major problem not known to be adequately researched is selected, namely the prospect that rising carbon dioxide levels in the atmosphere may bring the next ice age glaciation prematurely, thus curtailing the world food supply. The hypothesis that if the scientists in each specialized field involved had an educational background in general systems theory, they would be better prepared to cooperate on complex problems such as this, is examined. A table for testing hypotheses has been started.

INTRODUCTION

This paper is a progress report on the work of the Special Interest Group on Philosophy and Theory. Earlier reports were published in the Spring 1982 and the Fall 1982 issues of the General Systems Bulletin. Our general objective has been to examine how the use of general systems theory can help in the solution of some of the major world problems. We have started with a top-down procedure of looking at the worst catastrophies that could occur to our planet.

CATASTROPHIES AND MAJOR WORLD PROBLEMS

We have reviewed a book describing the disasters that threaten our world (Asimov,1981). Table I lists the possible catastrophies described by Asimov in classes 1 through 5, where 1 is the most severe. Since we are interested in the major world problems for which we can do something about, we combined the few castrophies from Assimov that are in our range of 50 years with an older list of some 40 major world problems (Platt, 1969). The resultant list was published in the Fall 1982 Bulletin (Wood, 1982, 29-30).

The six most significant problems of the 44 on the updated Platt chart are listed in Table II. We then reviewed this list looking for the severity and the presence of complexity that a general systems approach could help develop an understanding of the complexity. We choose the second on the list, namely the prospect of the next ice age coming prematurely due to mankind's destroying much of the world's forests, burning up fossil fuels, etc., to raise the carbon dioxide level in the atmosphere leading to severe weather changes culminating in the next glacial age coming early.

PROBLEM OF CARBON DIOXIDE AND GLACIATION

Will the rising level of carbon dioxide in our atmosphere cause the physical disruption of civilization by loss of food supply from advancing ice age glaciation? It is generally recognized that the planet earth has a 100,000 year major weather cycle, in which there is a 90,000 year ice age period consisting of many sub-cycles of glaciation and a 10,000 year warm period. One engineer's analysis (Hamaker, 1982) indicates that we are at the end of a 10,000 year warm cycle with an ice age imminent. The difficulty in

Table I - The Disasters That Threaten Our World.

Adapted from Issac Asimov(1981)

Catastrophies of the First Class:
- The Day of Judgement
- The Increase of Entropy
- The Closing of the Universe
- The Collapse of Stars

Catastrophies of the Second Class:
- Collisions with the Sun
- The Death of the Sun

Catastrophies of the Third Class:
- The Bombardment of the Earth
- The Slowing of the Earth
- The Drift of the Crust
- The Change of Weather
- The Removal of Magnetism

Catastrophies of the Fourth Class:
- The Competition of Life
- The Conflict of Intelligence

Catastrophies of the Fifth Class:
- The Depletion of Resources
- The Dangers of Victory

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checking Hamaker's analysis is that it requires correlation of material in about five different fields of science where there is not much intercommunication. If applying the philosophy of a general systems approach (Bowler, 1981) to the problems can improve communication between the specialists in the various fields involved, some progress could be made in determining whether this is really an urgent problem. John Hamaker thinks the time to go critical is 10 years. Can a general systems approach help the experts in the different fields cooperate so that we can obtain a better estimate of the time to go critical?

TABLE II - Abridged List of Major World Problems with Critical Time of 1 to 50 Years.

(Six of the forty-four problems listed in the more complete table in General Systems Bulletin(Wood 1982, 26-27) are listed here.)

Grade & Intensity.	Years to go Critical.	Problem Description.
10 1:10	5 to 20	Nuclear or radioactive, chemical, or biological warfare.
9 2:10	5 to 20	Food shortage from demineralization of soil, deforestation, rising carbon dioxide in atmosphere, and glaciation.
8 3:10	20 - 50	Computerized destruction of western civilization by creation of large class of unemployable people leading to rising crime rate leading to governments reacting by becoming more totalitarian.
7 4:10	1 to 5	Need for better respect for Women's Rights, can be helped by Equal Rights Constitutional Amendment in U.S.A.
7 4A:10	5 to 20	Need for General Systems Learning at all levels for citizens and government officers to understand complex social systems.
6 5:10	1 to 5	Legal problem of international cooperation such as Ocean Floor Mining under United Nations Law of the Sea.

Another approach to the problem is to develop a program to reduce the carbon dioxide level in the atomosphere by converting to renewable fuels and a massive energy conservation and building insulation program (Lovins, 1981). The logic of this plan is that we don't need to know the solution of the climatology problem of whether the high level of carbon dioxide will bring on the glaciers, if we just bring the CO/2 level back down toward the pre-industrial level.

IS IT A SCIENCE OR ENGINEERING PROBLEM?

The carbon dioxide / glaciation problem involves five major fields of science plus economics and planning to arrive at a solution if Hamaker's theory is verified. If this was a problem in one field of science such as physics, we could plan a many year program to test alternative hypotheses. We could look forward to building a chart for this problem like the chart in Table III which illustrates the way physicists compare Einstein's special theory of relativity to competing theories (Panofsky, 1962). The special theory of relativity has not really been proved. The comparisons summarized in Table III show that it is the only competing theory that agrees with the experiments, while every other theory disagrees with at least one major physics experiment.

We tried to set up a chart like Table III for the carbon dioxide & glaciation problem, but found that the normal review processes in the science organizations and journals and book publishers were organized for one and at most two fields of science.

If we spend ten years testing Hamaker's theory we might then find that the development of the next ice age had already reached a point of no return. So this appears to be moving toward an engineering problem rather than a problem in pure science.

QUASI-COMPLETENESS CHECKING CHART

Next we tried developing a chart for a quasi-completeness test of hypotheses similar to the chart proposed at the 1979 meeting in London (Wood, 1979). A special case chart for the carbon dioxide / glaciation problem is developed in Table IV. This table is useful to indicate the method and show progress in testing hypotheses. The plan is to fill in double letters in the squares to indicate the review of a hypothesis in particular fields such as agriculture or forestry. A single letter indicates the degree to which we

TABLE III - Testing of Hypotheses in Science.

THEORY		Light propagation experiments									Experiments from other fields						
		Aberration	Fizeau convection coefficient	Michelson-Morley	Kennedy-Thorndyke	Moving source and mirrors	De Sitter spectroscopic binaries	Michelson-Morley, using sunlight	Variation of mass with velocity	General mass-energy equivalence	Radiation from moving charges	Meson decay at high velocity	Trouton-Noble	Unipolar induction, using permant magnet
Ether theories	Stationary ether, no contraction	A	A	D	D	A	A	D	D	N	A	N	D	D
	Stationary ether, Lorentz contraction	A	A	A	D	A	A	A	A	N	A	N	A	D
	Ether attached to Ponderable bodies	D	D	A	A	A	A	A	D	N	N	N	A	N
Emission theories	Original source	A	A	A	A	A	D	D	N	N	D	N	N	N
	Ballistic	A	N	A	A	D	D	D	N	N	D	N	N	N
	New source	A	N	A	A	D	D	A	N	N	D	N	N	N
Special Theory of Relativity		A	A	A	A	A	A	A	A	A	A	A	A	A

LEGEND: A, the theory agrees with experimental results.
D, the theory disagrees with experimental results.
N, the theory is not applicable to the experiment.

find the person reporting on the hypothesis shows evidence of searching the particular field of science for the known data. We plan to expand the table by adding additional rows for other global systems theories about glaciation and also additional rows for particular sub-systems.

PLAN FOR COMPUTER SIMULATION MODEL

The asterisk in the column "computer models" in Table IV indicates there is a plan for a computer simulation model. A provisional block diagram for such a model is shown in Figure 1. The main sub-systems are based on World3 (Meadows, Dennis, 1974) with additional sub-systems added or split off to make visible the interactions of carbon dioxide and related parameters. In addition to the added sub-systems, an information sub-system is shown. In addition to the dynamic systems model, it is intended to develop input-output tables at certain strategic times as is indicated in Figure 1.

PLAN FOR OBTAINING REVIEWS OF SUB-SYSTEMS

We plan to utilize the recent membership list and classification by interest organized by Dr. August W. Smith in the Bulletin to find people who could review sub-systems or find people to do same.

CONCLUSIONS

From an engineering point of view as to what must be done to prevent a catastrophe, the highest priorities are: (1) Prevent nuclear war, and (2) Prevent a premature arrival of the next glacial age. Since the natural glacial cycles plus man-made accelerators of them involve at least five separate fields of science, the carbon dioxide glacial problem is the most urgent for application of a general systems approach. Most of Hamaker's analyses rate "A" for thoroughly examining the existing literature in the relevant fields of science, but we find no significant reviews by experts in these fields. We also find a blocked feedback cycle in that government science agencies are waiting for a public clamor to set their priorities, while the complex mix of material from more than five fields makes it difficult to explain the processes to the public and political leaders.

SGSR can take the role of a communications catalyst in arranging dialogues between engineers like Hamaker and the specialists in the relevant fields of science. We can also in due course put guesses for the unknown parameters into a global simulation model to show what unknowns are critical. Historically engineers put a safety factor into designs so that a building or bridge won't fall down. Similarly here the safety factor in regard to glaciation is to initiate action to correct the man-made factors contributing to a possible early glacial age, before the glaciation process becomes irreversible. Until specialists in the various fields of science get together and prove that Hamaker is wrong, for safety of mankind, I shall assume that his estimate that we have only to 1990 to reduce the rate of increase of CO/2, before it becomes irreversible for 90,000 years. I shall use the best of information technology in the home computer category to generate reports and exchange information over the telephone lines through the Source, EIES, local CommuniTree Systems, and mailing computer diskettes to those with computers without modems, and printouts by mail to those who don't have computers.

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Table IV - Testing of Systems Hypotheses relating to the Carbon Dioxide Problem and Glaciation.

1			EMPIRICAL SCIENCE					
2 Hypotheses	HUMANITIES: Intuitive, Poetic	COMPUTER MODELS: Abstract, Philosophical	Agriculture & Soils	Forestry	Glaciology	Energy	Climatology & Atmos CO/2	Economics & Planning
3 GLOBAL SYSTEMS								
4 Demineralization of Soil-> deforestation--> high atmos CO/2 -> wind changes ->Glacial Age (HAMAKER)		* (more data needed fr. lines 6-18 for sim.)	A	A	A	B	A	B
4 Skip Climatology and Use Renewable energy & conservation to reduce atmos CO/2. (LOVINS)						A	B	B
5 SUB-SYSTEMS								

(sub-systems to be added later as more rows in table)

Key to symbols:

A, B, C is rating for degree to which proponents of theory show evidence of having consulted the scientific literature of the respective fields.

AA, BB, CC is rating given by reviewers in the specified field, if available.

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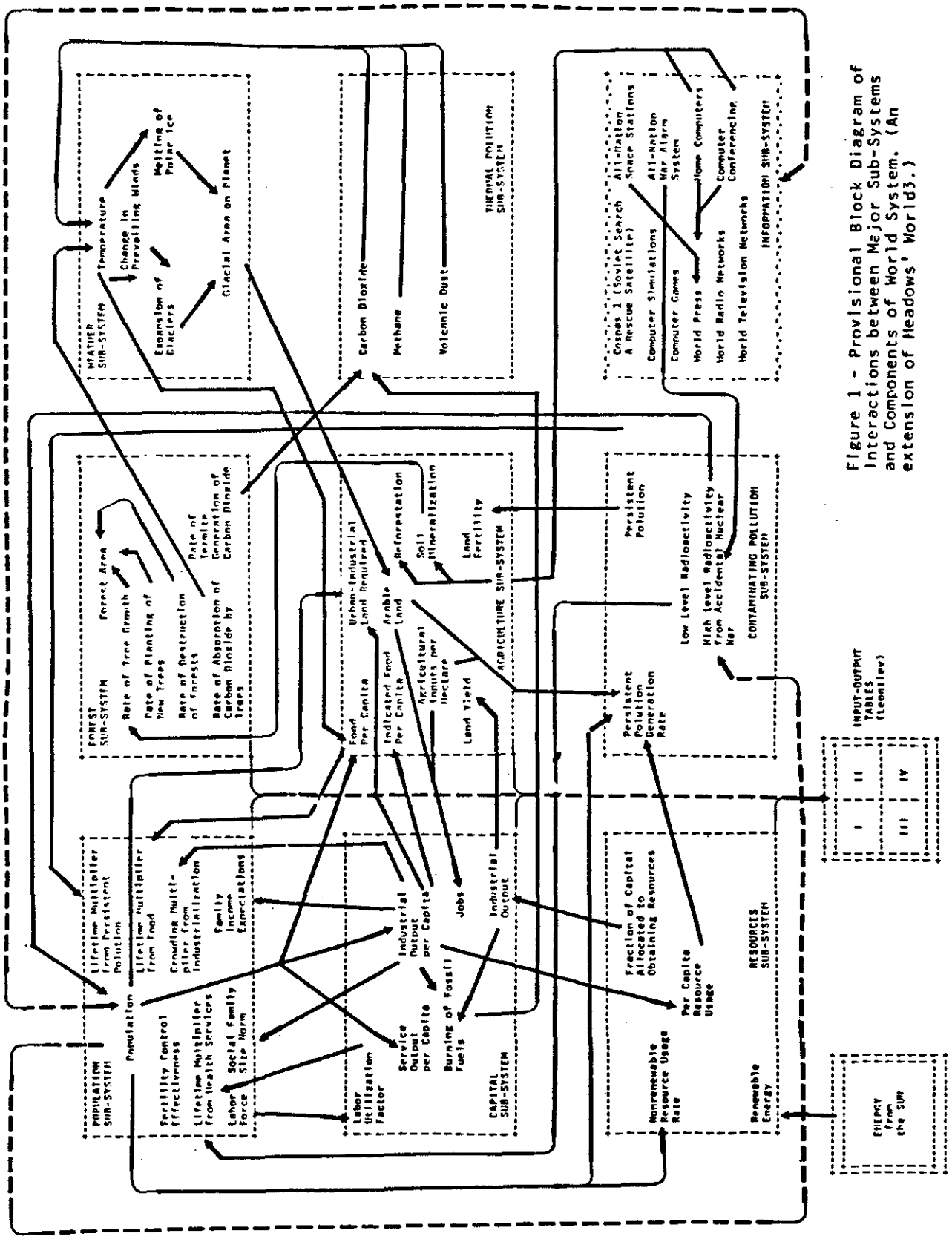

Figure 1 - Provisional Block Diagram of Interactions between Major Sub-Systems and Components of World System. (An extension of Meadows' World3.)