A Working Paper Draft

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SOCIO-ENGINEERING PROBLEMS No. 26-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.

A CHECKING CHART FOR THE USE OF COMPUTER ENGINEERS

DEVELOPED FROM A "GENERALIST" DESCRIPTION OF CULTURE: PART II

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" A Checking Chart for the Use of Computer Engineers Developed from a "Generalist Description of Culture."

Abstract

Issues 25-A and 26-A are Parts I and II of the third version of SEP No. 1. This version is based upon revisions made after reading Stuart Chase's book: Things Worth Knowing- A "Generalist's" Guide to Useful Knowledge.

This version has been outlined in SEP No. 4 under Problem 4.4: How can the checking chart for developing an analysis of social responsibility be derived more logically from a "generalist" description of culture? The material of Part II is organized under the following sections:

Example of 1958 WJCC Panel on Social Problems of Automation

Potential Use of Checking Chart by Engineers of the Future.

Conclusions

References.

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Example of 1958 WJCC Panel on Social Problems of Automation

Consider the panel on the social problems of automation at the 1958 WJCC. Here we have an example of cooperation of specialists from the computer industry, labor, and the social sciences. I shall consider for example the contribution of the social scientist, Dr. Lasswell (15). I quote from Lasswell:

"The development of computers has put in our hands a formidable instrument of enlightenment.....There is no reason why working models of social history and of the future should not be a part of the ordinary equipment of educational institutions and of institutions of civic decision. The entire social process can be portrayed in alternative models which show such estimated consequences as the following: the effect of at least two levels of expenditure upon arms; the consequesces of cutting the hours of work over a given period to six, four, and two hours a day....."

"We can, for instance, extend a means of popular instruction that has been applied to astronomy to the field of public opinion and decision making. I refer to the possibility of a social planetarium. The social planetarium will enable visiters to rehearse the past and to prehearse the future. Alternative posicies relating to economic progress and stabilization, for example, can be presented step by step. In this way the meaning of alternative courses of action can be grasped by most of the population, not only by a specialized few. Competing interpretations can be candidly set forth in presentations approved by competent

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specialists so that the viewer-participant can arrive at a well-disciplined estimate of the likelihood of one or the other outcome. ....."

These proposals of Dr. Lasswell are illustrated graphically in Figure 4. Here the computer is shown on the physical and chemical levels, part under basic science and part under engineering. Simulation programs in the engineering science column are shown in the social and psychological phenomena levels, the levels of phenomena that require simulation. Theories No. 1 and No. 2 are shown to illustrate two competing hypotheses to be tested in the simulation program. Specialists from the social sciences are shown in the role of checking the validity of the simulation program and the audio-visual display in the social planeteria. The resultant "public decision making" in a more enlightened manner is shown on the social and psychological levels in the Action column of Figure 4. I shall leave as an exercise for the reader, the filling in of the contributions of the other members of the panel on the checking chart.

If computer engineers succeed in pushing the development of simulation programs and display techniques to the stage needed to realize Dr. Lasswell's "social planeteria," they will have taken on a social responsibility far more important than simple YES-NO decisions on particular projects.

If we compare the spiral of culture of Figure 1* with the social planeteria checking chart of Figure 4, we see that

*See SEP No. 25-A for Fig. 1.

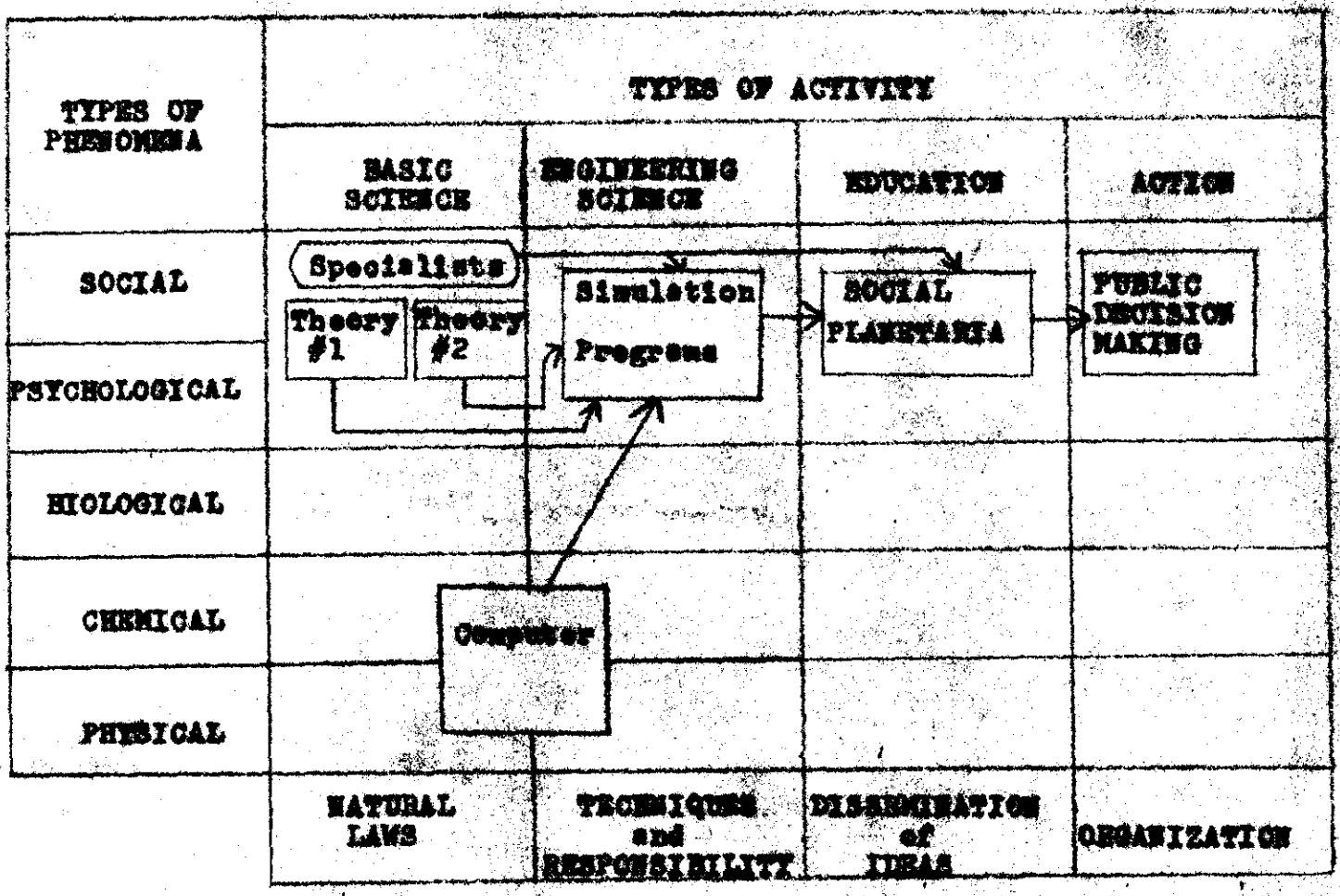

Figure 4 - Example of the Social Planetaria of the Future Proposed by Dr. Lasswell.

the future development of these social planeteria would make possible an accelerated balancing of the spiral of culture by expanding the possible spirals through the psychological and social phenomena levels where there have been fewer breakthroughs. Further, this would help correct the lag in the social sciences which Stuart Chase has pointed out .(12)

Potential Use of Checking Charts by Engineers of the Future

People may argue that Steinmetz was a genius and one cannot normally expect an engineer to deal with both the engineering and the sociological aspects of his work. Furthermore, some people point out that Steinmetz was a bachelor without family responsibilities. So let us see how the checking chart can be used by the engineer of the future to help develop a reasonable amount of social responsibility without placing an undue time burden on him that would interfere with his engineering work and normal family activities. My thesis is that any new discovery in science or invention in engineering has far-reaching implications throughout all human activity. Further I claim that an engineer, who does not have much spare time on account of his basic engineering work and his family responsibilities, can find short cuts to understanding the social implications of his work through devices such as the checking chart of Figure 2. I have faith that the engineer can fulfill his social responsibility to help make the results of his work be utilized in tune with mankind's highest aspirations.

To fulfill his social responsibility the engineer must understand that it is a responsibility he shares with many people both inside and outside his profession, for example see the range of activities listed in Table I which are represented in the spiral of culture. He may not need to devote a tremendous amount of time and energy to the social implications of his work. The key to success lies in developing a fruitful perspective of the relationship of his work to the society in which he lives. The checking chart of Fig. 5 is suggested as an aid to each engineer in developing his own perspective. The ordinary engineer need not expect his activity to cover the whole spiral of culture, nor to encompass the range of Steinmetz marked on Figure 3, nor to have as comprehensive a coverage as the social scientists.

He may have a group of friends and correspondents who cover different areas of the checking chart or he may maintain contact with different organizations which cover different areas of the chart. A sample chart is shown in Fig. 5, which illustrates the case of an electrical engineer who has established a network of communication channels which enable him to discharge his social responsibility with a minimum of effort. In this example of an hypothetical engineer, he does not by himself cover the whole area, but has friends who cover parts of the area and share with him their understanding of the problems of our complex industrial civilization.

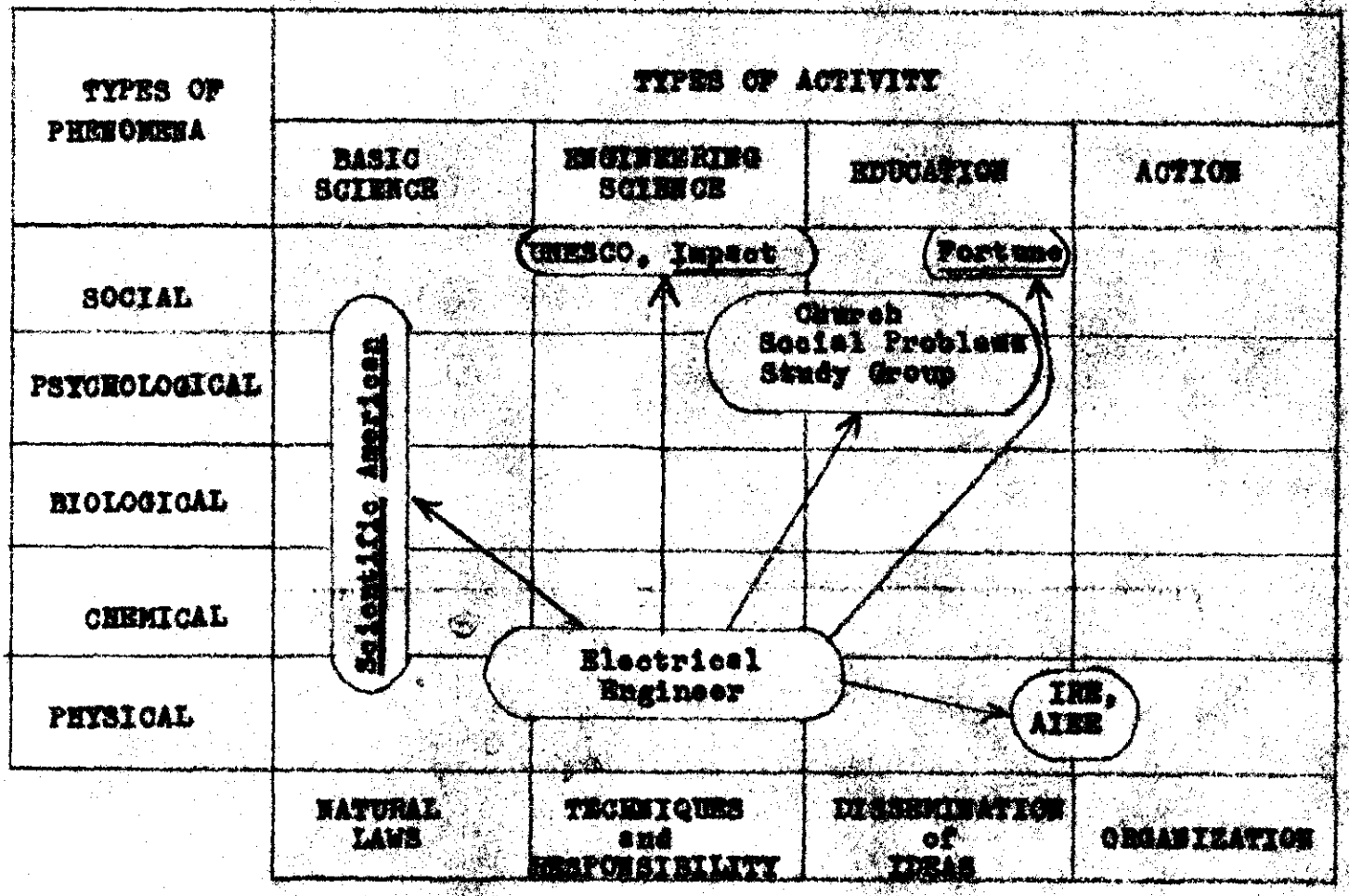

Figure 5. Example of Checking Chart Used to Show Coverage of the Areas of Social Responsibility.

In this example shown in Fig. 5 our electrical engineer belongs to his technical society: American Institute of Electrical Engineers or the Institute of Radio Engineers. These are shown in Fig. 5 on the physical phenomena level under education and action. If he considers the following definition of an engineer given by the Engineers Council for Professional Development:(16)

> "The engineer may be regarded, therefore, as an interpreter of science in terms of human needs and a manager of men, money, and materials in satisfying these needs,"

Some narrowing down is required to develop a reasonable area of activity. The second part of the definition, namely "a manager" depends upon his own development and the opportunities in his particular specialized branch of engineering. The first part "an interpreter of science in terms of human needs" can be split into two parts:

(1) the specialized engineering work of his job, and

(2) the more generalized interests he may take up as hobbies.

In his specialized engineering work he has acquired through education and experience the portions of basic science that are most useful in his particular engineering assignment. The human needs on his job assignment have been evaluated by other people so that the human needs have already been translated into engineering objectives. To fulfill his role as "interpreter of science in terms of human needs", he needs some more direct contact with both

science and with human needs. He can read some magazine such as the Scientific American, which has popular articles on all levels of phenomena, as a way of keeping abreast of developments in science. This is shown in Fig. 5 as a partial coverage of the basic sciences. To obtain a more direct contact with human needs, he can participate in a church social problems study group. This is shown as overlapping the psychological and social phenomena levels in the engineering and education columns.

In order to develop a better understanding of the business world in which the results of his engineering work are used, he can read a magazine such as Fortune. He can develop a better perception of the social effect of science on a world scale by following the activities of the United Nations, Educational, Scientific, and Cultural Organization (UNESCO) by reading one of their bulletins such as the quarterly Impact of Science Upon Society.

Conclusions

The recent discussions of the social problems of automation at the WJCC and the discussions of the possibility of the destruction of civilization in Computers and Automation are a healthy sign that some engineers are developing a perspective of how their special field relates to the activities of mankind in general. Engineers need some kind of a framework or coding scheme to present an abstract but significant view of human activity to which they can correlate their own work.

Consideration of the "spiral of culture" as a shorthand representation of the process of the development of civilization leads to the concentration on a "slice" of the spiral which can be used as a "checking chart" to assist computer engineers and scientists, to contribute significantly to the protection and orderly growth of our civilization. This can be carried out in two parts:

(1) By insuring that our country supports research in the fields of art and science that are needed to solve the social problems accompanying the rapid technological advances.

   (a) By developing an understanding of the limitation of their own areas of specialization.

   (b) By establishing contacts with other specialists.

   (c) By using the above two items to determine the adequacy of the coverage of the social problems related to one's special work.

References

1-14 See SEP No. 25-A

15. Harold D. Lasswell "The Social Consequences of Automation" Proc. Western Joint Computer Conference. Los Angeles, May 1958.

16. Engineers Council for Professional Development "Engineering as a Career", p. 6 (1942).