

Stage H
of A to T.

A Working Paper Draft
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SEPR No. 61-A

SOCIO-ENGINEERING PROBLEMS REPORT No. 61-A

"A QUEST FOR UNDERSTANDING THE RELATIONSHIP OF
ENGINEERING WORK TO CULTURE."

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by

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essence whose sun-like color reflected the immortal quality of the psyche. The stages of transformation which the alchemist believed to have observed in the vessels of his laboratory were transposed in his imagination into the animated personification of the various elements and substances which he was trying to synthesize into a new wholeness. According to Jung's conclusions the medieval alchemical symbolism represents a powerful upsurge on the part of the unconscious in the spiritual history of Western Europe." (3)

Further my recent reading of Jung's "Five Chapters from: Aion: Contributions to the Symbolism of the Self" (4) has given me some valuable insights into my own mental and emotional processes.

The consequences of these developments is that I now realize that many years ago I partially worked out these problems of the relationship of my engineering work to the society in which I live, but I had dropped the ideas before completion after running into hostile criticism. Further examination reveals that the periods during which I have been able to concentrate in depth successfully on specific engineering and mathematical problems corresponded closely to periods of time when I have succeeded in maintaining some perspective relating my engineering work to an important ethically desirable goal.

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3. ibid., p. xxvi.

4. ibid., pp. 1-60.

*The following notes are added for reference
part more better notes, with some additions to*

After I graduated from University High School, Oakland, Calif., in 1936 I entered the University of California, majoring in electrical engineering. My elective courses outside of engineering were in physics and economics. I was elected to Phi Beta Kappa, Sigma Xi, Tau Beta Pi, Eta Kappa Nu, and Pi Mu Epsilon (mathematics) and was a student officer of the A.I.E.E. My B.S. degree was conferred with honors in May 1941. I worked for two summers in the Pacific Gas and Electric Co. electric meter shop and worked part time in my senior year in the U. C. High Voltage Laboratory on the development of resonatron tubes and on glow discharge phenomena.

Starting in February 1941, I was employed by the M.I.T. Radiation Laboratory. There I worked on the design, construction, and test of prototype microwave transmission lines and radio frequency circuits of radar sets. Then I worked on gas transmit-receive tubes at the Radiation Laboratory in cooperation with Raytheon Mfg. Co. I conducted acceptance tests on the 721A tubes for the Navy, (which resolved a controversy between two manufacturers as to the best design for the 721A.)

Then I designed and tested frequency meters, radar beacon frequency reference cavities, and echo boxes. I handled the distribution of ten-centimeter wavelength standard frequency cavities to the Army, Navy and principal radar manufacturers.

After working a few months on writing instruction manuals for radar test equipment, I was promoted to Section Chief of the Test Equipment Instruction Manual Section of the Radiation Laboratory. While supervising the manual writing, I developed an improved procedure for instructing personnel on testing radar with frequency-modulated test sets which was adopted by the Navy.

I wrote or edited over fifty M.I.T. Radiation Laboratory reports, principally on radar test equipment.

From March to September of 1946, I worked part-time at the University of California Radiation Laboratory in Berkeley, consulting on the procurement and use of microwave r-f test equipment.

(8/19/53)

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There is an initial contradiction, in that the direct solution of Maxwell's equations is not necessarily the case for computer problems, as is often the case for radar problems. My line of interest now is to bridge from electromagnetic theory to communication theory(information theory and cybernetics) by means of components such as coheres, electrostatic equipment utilizing the theory of electricity and magnetism in their internal operations and being a part of a communication system.

See "Trends and Equilibria in Nature and Society."

I joined the IBM Research and Development Laboratory because the program of IBM is oriented in a direction to bridge the gaps between the specialized fields of physical science, engineering, social science, and philosophy that are the major stumbling blocks to the solution of the major problems of our civilization. The development of business accounting machines to save dollars in business has also made available tools for attacking broad economic, psychological, and social problems which must be solved if our civilization is to maintain a position of leadership in the world. The particular portion of the overall program that appeals to me for the immediate future is the development of logical circuit elements which in their application involve philosophy (logic) and in their internal operation involve the theory of electricity and magnetism.

I was appointed the Harry H. Hilp Fellow in Engineering at U. C. for academic year 1946-47 and 1947-48. I studied graduate courses in Electrical Engineering and mathematics, and economics. My thesis title for the M.S. in June 1948 was "Coupling of Power from a Resonant Cavity or Load at Microwave Frequencies."

I was reappointed Harry H. Hilp Fellow in Engineering for 1948-49 and continued as a research engineer (part-time) in the Microwave Laboratory for 1949-52. During the period I took further graduate courses in mathematics, physics and electrical engineering. My research for the Ph.D. was completed in the summer of 1952 and the degree was conferred in June 1953. The thesis title was "Coupling between Waveguides and Cavity Resonators for Large Power Output."

I examined the potential course of the various research and development organizations in relation to the more significant problems of our age. The development of our civilization and science and engineering has reached a stage where the various fields of engineering and science have become very specialized and subdivided. An integration of the specialists appears to be required to make further advances in the psychological, social and economic sciences. The company doing the most to provide the tools in the form of computing systems was found to be IBM. Thus I believe that IBM is in a position to develop a more obvious connection between the design of electrical components, their use in logical circuits, and the application of computing machines to the long run problems of our civilization.

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The IBM Research Laboratory presents an opportunity for me to make a more general application of my training to the long run problems of our civilization. I joined the IBM Laboratory, because it offered an opportunity to work on projects which potentially come closer to applying engineering toward the solution of the long run problems of our country. By way of explanation, engineering work with different organizations is weighted toward solution of immediate short-run problems such as improved radar, bombsights, radar countermeasures, etc. or it is weighted toward commercial development which may expand and stabilize the economy. The nature of the international situation at times requires primary emphasis on the short run problems. It is my opinion that in the long run the nations that will most successfully come through the present international crises are those who are able to understand more quickly what is happening in their economy and to take steps to control or correct instabilities while preserving and developing the freedom of the individuals. The extension of computing techniques offers a clear path toward solving aspects of the long-run problems of society.