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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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Date: Jan 1960 1/18/61 6/29/61 11/27/61 10/14/62

Stage: SEP 9 Stage H SEP S=6 SEP 54 SEP 5

Date: 8/19/53 5/26/61 1/6/62

Stage: Weapo SEP S-11 SEP 61

Date: 3/13/66

Stage: Reviewed

7/6/63

Pts. 53-A 61 Combined into SEPR 61-A 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 successfuly 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.

Cast new histories visites in the Same histories to be

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 rwo summers in the Pacific Gas and Electric Co. electric meter scop and worked part time in my senior year in the U. C. High Voltage Laboratory on the development of resnatron tubes and on glow discharge phenomena.

^{3. 1}bid., p. xxvi.

^{4.} ibid., pp. 1-60.

Radiation Laboratory. There I worked on the design, construction, and test of protype microwave transmission lines and radio frewuency circuits of radar sets. Then I worked on gas transmitreceive tubes at the Radiation waboratory 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 the 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.

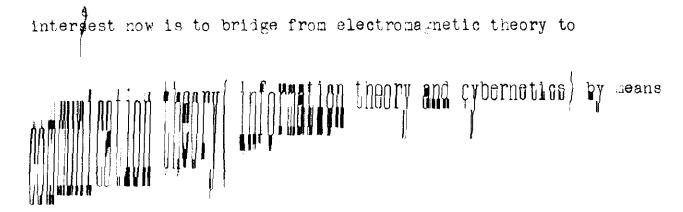
After working a few months on writing instruction manuals for radar test equipment, I was promoted to Section Chief of the Test Equipment Instruction Manual Section of the Radiation Laboratory. While supervising the manual writing, I developed an improved procedure for instructing personnel on testing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

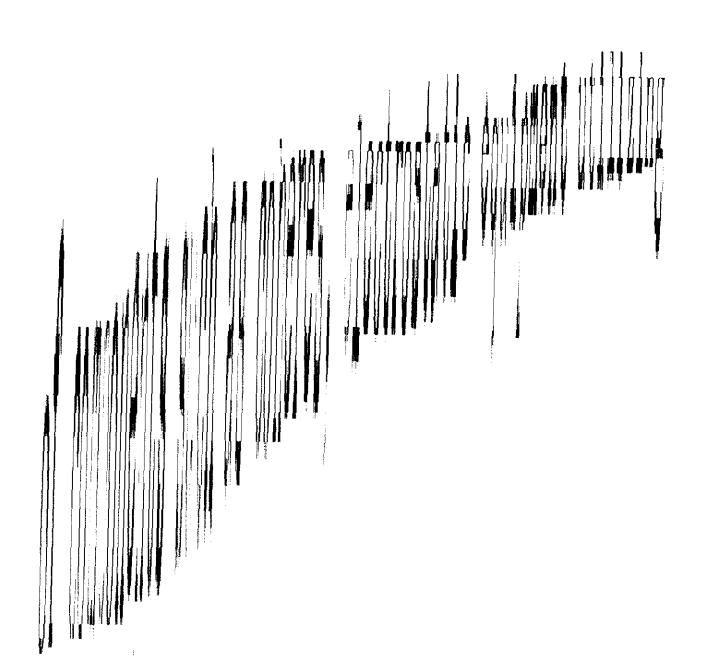
I wrote or edited over fifty M.I.T. Radiation Laboratory reports, principally on radar test equipment.

From March to September of 1046, 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.

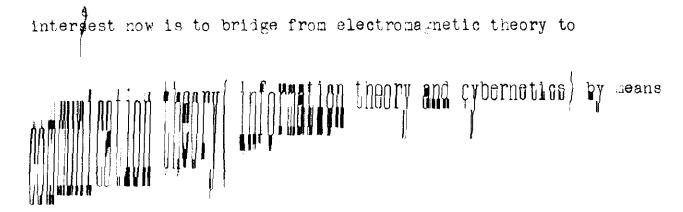
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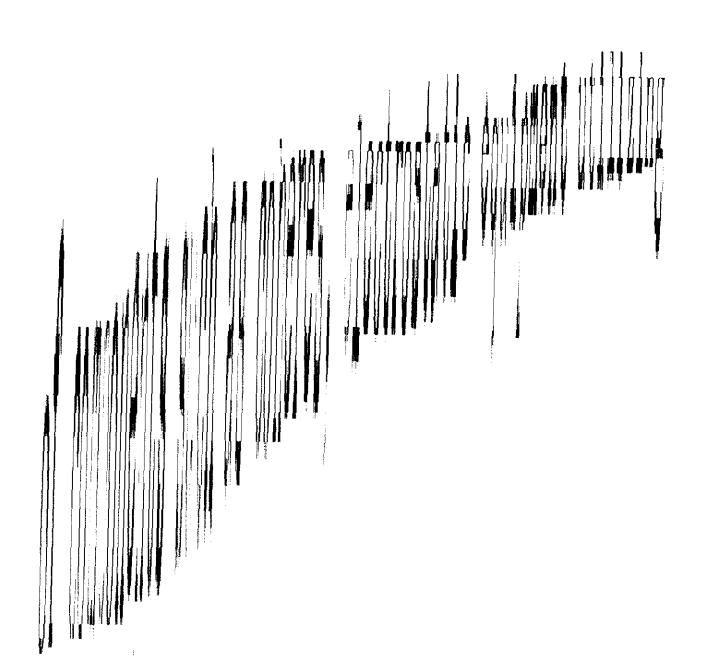
There is an initial contradiction, in that the direct solution of M axwell's equiations is not necessarily the case for computer problems, as is often the case for radar problems. My line of intersest now is to bridge from electromagnetic theory to





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There is an initial contradiction, in that the direct solution of M axwell's equiations is not necessarily the case for computer problems, as is often the case for radar problems. My line of interfest 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 worlety."

I joined the IBM Research and Development Laboratory because the program of IBM is criented 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 \$f\display\$ dion 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 148 was "Coupling of Power from a Resonant Cavity or Load at Microwave Frequencies."

I was reappointed Harry H. Hilp Fellow in Engineering for 1945-49 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 reserch for he 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 postion to develop a more obvious connection between the design of electrical components, their use in logical circuits, and the application of computing mechines to the long run problems of our civilization.

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 differend 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 internatinal 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 fore suickly what is happening in their economy and to take steps to control or correct instabilities while reserving and developing the freedom of the individuals. The extension of com uting techniques offers a clear bath toward solving aspects of the longrun problems of society.