Jay Wright Forrester

Born July 14, 1918, Climax, Neb.; Massachusetts Institute of Technology leader of the Whirlwind Project and inventor of the random-access magnetic core memory matrices.[1] 5

Education: BSc, University of Nebraska, 1939; SM, MIT, 1945.

Professional Experience: MIT: member, staff Servomechanisms Laboratory, 1940-1946, director, Digital Computer Laboratory, 1946-1951, head, Digital Computer Division, Lincoln Laboratory, 1951-1956, professor of management, 1956-1972, Germeshausen professor, 1972-1989, Germeshausen professor emeritus and senior lecturer, 1989-present.

Honors and Awards: DEng, University of Nebraska, 1954; National Academy of Engineering, 1967; DSc, Boston University, 1969; Valdemar Poulsen Gold Medal, Danish Academy of Technical Sciences, 1969; DEng, Newark College of Engineering, 1971; Medal of Honor, Institute of Electrical and Electronics Engineers, 1972; System, Man, and Cybernetics Award for Outstanding Accomplishment, IEEE, 1972; Benjamin Franklin Fellow, Royal Society of Arts, London, 1972; DEng, Union College, 1973; DEng, University of Notre Dame, 1974; Howard N. Potts Award, Franklin Institute, 1974; honorary member, Society of Manufacturing Engineers,[2] 1976; Harry Goode Memorial Award, American Federation of Information Processing Societies, 1977; Doctor of Political Science, University of Mannheim, Germany, 1979; Inventors Hall of Fame, 1979; Computer Pioneer Award, IEEE Computer Society, 1982; Jay W. Forrester Chair in Computer Studies at MIT, endowed by Thomas J. Watson, Jr., 1986; James R. Killian, Jr., Faculty Achievement Award, MIT, 1987; honorary professor, Shanghai Institute of Technology, China, 1987; Information Storage Award, IEEE Magnetics Society, 1988; Doctor of Humane Letters, State University of New York, 1988; US National Medal of Technology (with Robert R. Everett), 1989; Pioneer Award, IEEE Aerospace and Electronic Systems Society (with Robert R. Everett), 1990; DPhil, University of Bergen, Norway, 1990; fellow, IEEE; fellow, Academy of Management; fellow, American Academy of Arts and Sciences; fellow, American Association for the Advancement of Science.

Forrester became interested in digital computing when a project to develop a Navy aircraft stability analyzer was determined to be too difficult for an analog computer. The characteristics of the system required a fast, accurate, general-purpose machine. Perry Crawford, then with the Special Devices Center of the US Navy, suggested the use of a digital system. Forrester took charge of the design and construction of Whirlwind I, but discovered that the delay line and electrostatic memory systems being used in other digital machines of the time would not permit the construction of a machine which met the reliability and speed requirements. From this need Forrester developed the basic concept of random-access storage in 1947 based on glow-discharge cells,

[1] The “invention” of the magnetic core as a memory device is claimed by An Wang. Forrester developed the addressing mechanism which made it a practical random-access system.

[2] For contributions to the digital control of machine tools.

and later recast the concept in 1949 as toroidal, random-access, coincident-current magnetic storage that became the standard internal memory for computers for nearly 30 years. By 1951, the Whirlwind computer was in operation, but by then the purpose of the machine had been changed to support the planning and design of the SAGE (Semi-Automatic Ground Environment) Air Defense System.

In 1956 Forrester became professor of management at MIT's Alfred P. Sloan School of Management, where he established the field of system dynamics for determining how the structure and policies of physical, social, and environmental systems determine growth, oscillation, and stability. He has developed the System Dynamics National Model for understanding economic fluctuations. The model demonstrates the underlying theory of the economic long wave (or Kondratieff cycle) that has created the great depressions of the 1830s, 1890s, 1930s, and probably of the 1990s. From his work in understanding complex systems has come the international System Dynamics Society and applications to corporate management, economic behavior, medicine, urban growth and decay, and world population and environmental forces. Most recently, system dynamics is becoming a foundation for an integrated educational framework in junior and senior high schools.

QUOTATIONS

“The pioneering days in digital computers were exciting times. Computer development was part of the last hundred years of technological discovery. However, the major challenges facing society will not be solved by still more technology. The next hundred years will be the age of social and economic discovery. The field of system dynamics, with which I have been associated since 1956, has pioneered in understanding how organizational structures and decision-making policies interact to produce desirable and undesirable behavior in physical, biological, environmental, business, and social systems. I see this next frontier in social systems as far more exciting and important than was the technological frontier.”

“There is now promise of reversing the trend of the last century toward ever greater fragmentation in education. There is real hope of moving back toward the 'Renaissance man' idea of a common teachable core of broadly applicable concepts. We can now visualize an integrated, systemic, educational process that is more efficient, more appropriate to a world of increasing complexity, and more supportive of unity in life. Several high schools, curriculum-development projects, and colleges are using a system dynamics core to build study units in mathematics, science, social studies, and history.”

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UPDATES