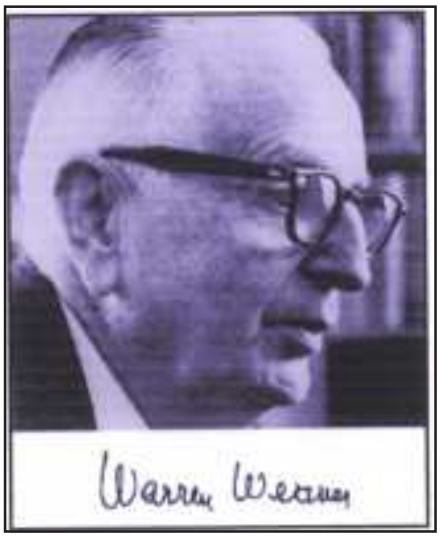
UNESCO – Kalinga Prize Winner – 1964



Warren Weaver

US Mathematician, Scientist & Educator

[Birth : July 17, 1894 in Reedsburg , Wisconsin
Death : November 24, 1978 in New Milford, Connecticut]

Science tries to answer the question: “How?” How do cells act in the body? How do you design an airplane that will fly faster than sound? How is a molecule of insulin constructed? Religion, by contrast, tries to answer the question: “Why?” Why was man created? Why ought I to tell the truth? Why must there be sorrow or pain or death? Science attempts to analyze how things and people and animals behave; it has no concern whether this behavior is good or bad, is purposeful or not. But religion is precisely the quest for such answers: whether an act is right or wrong, good or bad, and why.

“The century of biology upon which we are now well embarked is… a movement of really heroic dimensions, one of the great episodes in man’s intellectual history.”

Warren Weaver

Warren Weaver (1894-1978)

BIOGRAPHICAL PROFILE

Waren Weaver was born in Reedsburg, Wisconsin, in 1894. He studied in the University of Wisconsin. He initiated his educational activity in the Throop College de Pasadena (1917-1918) and in California Institute of Technology (1919-1920), before entering the University of Wisconsin, where he taught for twelve years and was director of the Department of Mathematics (1928-1932). In 1932, he became director of the Division of Natural Sciences of the Rockefeller Institute , that exerted until 1955, and later vice-president of the Division of Natural and Medical Sciences (1955-1959). From the Rockefeller Institute he promoted the work of the young scientists, specially in lines of investigation like the genetics and 'Molecular Biology ', term that enunciated the own Weaver in 1932. During World War II he headed the Applied Mathematics Panel, who reunited to scientific well known in the study of solutions that would have a great influence in the developments of the postwar period. He became Vice-president of the Sloan-Kettering Institute of investigation on the cancer (1950).

Weaver was interested in the study of the technical processes of the communication during the years of the war (cryptography, automatic decoding, etc.), in 1949 he wrote with Claude E. Shannon *The Mathematical Theory of Communication.* In the same year, in a report for the Rockefeller Foundation, Weaver indicated that an analogy between the mechanical decoding and the translation existed, reason why promoted the investigation for the development of systems of automatic translation, whose first results appeared in the University of Georgetown with the use of the Russian and English languages.

He was enthusiastic in the benefits for the development and progress of the society through the spreading of science (in 1954 he was named president of the American Association for the Advancement of Science). He wrote an autobiography under the title. To Lifetime in American Science, Scribners, New York, 1970.

Between the numerous decorations, He was granted the British Medal by Cause (1948),Official of the Legion of Honor of France (1951), **The Kalinga Prize of UNESCO (1964),** as well as diverse doctorates honoris causá, among them by the Universidade de Sao Paulo (1952). He passed away in the year 1978.

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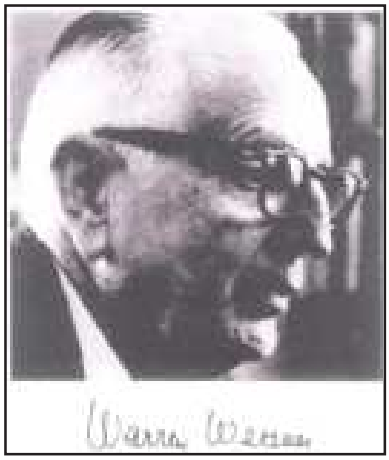
Warren Weaver



Warren Weaver, 1894-1978, American scientist, b. Reedsburg, Wis., grad. Univ. of Wisconsin. He taught mathematics at Wisconsin (1920-32), was director of the division of natural sciences at the Rockefeller Institute (1932-55), and was science consultant (1947-51), trustee (1954), and vice president (from 1958) at the Sloan-Kettering Institute for Cancer Research. Weaver's chief researches were in the problems of communication in science and in the mathematical theory of probability. He was one of the founders of information theory, or communication theory. His writings include the preface to the seminal work in the field, Claude E. Shannon's The Mathematical Theory of Communication (1949).

Name : Warren Weaver Sr.

Dates : 1998 –1978

Worked at : University of Wisconsin; Rockefeller Foundation

Other Information: Weaver worked at : Assistant professor, Throop College, Pasadena, CA 1917-18; Assistant professor of mathematics, California Institute of Technology 1919-20; University of Wisconsin (Madison): Assistant professor 1920-25; Associate professor 1925-28; Professor of mathematics and chairman of department 1928-32; Rockefeller Foundation: director of natural sciences 1932-55; Vice-pres. For natural and medical sciences 1955-59; Alfred P. Sloan Foundation:Trustee and member of executive committee 1956-67; Vice-press. 1959-64; Consultant on scientific affairs 1964-78; Served on numerous boards and chaired numerous committees.

While at Rockefeller Foundation, Wever promoted research in experimental biology and agricultural science, emphasizing improving human nutrition . He wrote autobiography entitled Science of Change: A Lifetime in American Science; See Contemporary Authors article (in Volume 89, p. 552) as well as Colin Burke's Information and Secrecy.

Awards : 1948 Medal for Merit; 1948 Medal for Service in the Cause of Freedom (Great Britain); 1948 LL.D. (University of Wisconsin); Sc.D.: 1949 (University of Sao Paulo – Brazil); 1961 (Drexel Institute of Technology; 1964 (University of Pittsburgh; 1951 French Legion of Honor (officer); 1957 Public Welfare Medal (NAS); **1964 Kalinga Prize (UNESCO);** 1964 Arches Science Award (Pacific Science Center).

Offices : AAAS Fellow; NAS:Press.; Chairman of the Board; American Association for the Advancement of Science Fellow; APS Councillor 1957-60.

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WARREN WEAVER QUOTES

Science attempts to analyze how things and people and animals behave; it has no concern whether this behavior is good or bad, is purposeful or not. But religion is precisely the quest for such answers: whether an act is right or wrong, good or bad, and why.

Science is not gadgetry.

We keep, in science, getting a more and more sophisticated view of our essential ignorance.

The Science of Molecular Biology

In the 1930s and 1940s the Rockefeller Foundation helped to create a new field of science-molecular biology-that brought methods from physics and chemistry into biology, the study of life. Although the Foundation did not focus its grants on DNA research, it supported scientists throughout the world who began to explore the molecular makeup of cells. The work of these researchers provided the underpinning for the discovery of the DNA double helix.

New Tools for Discovery :

A young mathematician named Warren Weaver (1894-1978) directed the Rockefeller Foundation's activities in this new field. Weaver promoted interdisciplinary research by making grants to institutions to purchase new and expensive technologies that the biologists had to share with physicists and chemists. This strategy brought x-ray machines, electron microscopes, ultracentrifuges, spectroscopes and particle accelerators to bear on investigations of the cell. The frontier of biological research moved from studies of organisms toward attempts to understand the activity of the most fundamental organic units – molecules.

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Warren Weaver

BIOGRAPHICAL SKETCH

Warren Weaver (b.July 17, 1894 in Reedsburg, Wisconsin d. November 24, 1978 in New Milford, Connecticut) was an American scientist, mathematician, and science administrator.

Weaver graduated in 1919 at the University of Wisconsin with degrees in civil engineering and mathematics. He became an assistant professor of mathematics at Throop College (soon to be re-named the California Institute of Technology) before returning to teach mathematics at Wisconsin (1920-32). He was director of the Division of Natural Sciences at the Rockefeller Foundation (1932-55), and was science consultant (1947-51), trustee (1954), and vice president (from 1958) at the Sloan-Kettering Institute for Cancer Research. Weaver's chief researches were in the problems of communication in science and in the mathematical theory of probability and statistics.

At the Rockefeller Foundation, he was responsible for approving grants for major projects in molecular engineering and genetics, in agriculture (particularly for developing new strains of wheat and rice), and in medical research. During World War II, he was seconded from the Foundation to head the Applied Mathematics Panel at the U.S. Office of Scientific Research and Development, directing the work of hundreds of mathematicians in operations research. He was therefore fully familiar with the development of electronic calculating machines and the successful application of mathematical and statistical techniques in cryptography.

He was co-author (together with Claude Shannon) of the landmark work on communication, The Mathematical Theory of Communication (1949, Urbana: University of Illinois Press).While Shannon focused more on the engineering aspects of the mathematical model, Weaver developed the philosophical implications of Shannon's much larger essay (which forms about 3/4th of the book).

Weaver had first mentioned the possibility of using digital computers to translate documents between natural human languages in March 1947 in a letter to the cyberneticist Norbert Wiener. In the following two years, he had been urged by his colleagues at the Rockefeller Foundation to elaborate on his ideas. The result was a memorandum, entitled simply

"Translation," which he wrote in July 1949 at Carlsbad, New Mexico (Reproduced in: Locke, W.N. and Booth, A.D. (eds.) Machine translation of languages: fourteen essays (Cambridge, Mass.: Technology Press of the Massachusetts Institute of Technology, 1955), pp. 15-23.)

Said to be probably the single most influential publication in the early days of machine translation, it formulated goals and methods before most people has any idea of what computers might be capable of, and was the direct stimulus for the beginnings of research first in the United States and then later, indirectly, throughout the world. The impact of Weaver's memorandum is attributable not only to his widely recognized expertise in mathematics and computing, but also, and perhaps even more, to the influence he enjoyed with major policy-makers in U.S. government agencies.

Weaver's memorandum was designed to suggest more fruitful methods than any simplistic word-for-word approach, which had grave limitations. He put forward four proposals. These were that the problem of multiple meanings might be tackled by the examination of immediate context; that it could be assumed that there are logical elements in language; that cryptographic methods were possibly applicable, and that there may also be linguistic universals.

At the end of the memorandum, Weaver asserted his belief in the fourth proposal with what is one of the best-known metaphors in the literature of machine translation: "Think, by analogy, of individuals living in a series of tall closed towers, all erected over a common foundation. When they try to communicate with one another, they shout back and forth, each from his own closed towers. It is difficult to make the sound penetrate even the nearest towers, and communication proceeds very poorly indeed. But, when an individual goes down his tower, he finds himself in a great open basement, common to all the towers. Here he establishes easy and useful communication with the persons who have also descended from their towars."

Weaver early understood how greatly the tools and techniques of physics and chemistry could advance knowledge of biological processes, and used his position in the Rockefeller Foundation to identify, support, and encourage the young scientists who years later earned Nobel Prizes and other honours for their contributions to genetics or molecular biology.

He has a deep personal commitment to improving the public understanding of science. He was President of the American Association for the Advancement of Science in 1954 and Chairman of the Board in 1955, a member or chairman of numerous boards and committees, and the primary author of the Arden House Statement, a 1951 declaration of principle and guide to setting the Association's goals, plans and procedures. **In 1965 he was awarded the first Arches of Science Medal for outstanding contributions to the public understanding of the meaning of science to contemporary men and women and UNESCO's Kalinga Prize for distinguished contributions to the popular understanding of science.**

Weave married Mary Hemenway, one of his fellow students at the University of Wisconsin, a few years after their graduation. They had a son, Warren Jr., and a daughter, Helen.

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