Frederick Seitz FREE

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physics that were exceptional for their clarity. Although those responsibilities distracted him from what he liked most—his research—he took them seriously, invariably creating an atmosphere of human decency, benevolence, and teamwork. Dozens of physicists, including the four of us, consider Perel to be their true teacher in physics.

Many sought his advice and suggestions in both scientific and difficult life matters, and they felt better after talking with him. Perel presented an exceptional combination of talent, knowledge, modesty, tolerance, and the highest moral standards. Highly esteemed and loved by everyone who knew him, he will be deeply missed.

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Frederick Seitz

Frederick Seitz, who died in New York on 2 March 2008, was a brilliant scientist and author, a skillful academic leader, a major participant in the development of solid-state physics, an influential national and international spokesman for science, and the founder of a powerful solid-state physics group at the University of Illinois at Urbana-Champaign.

Born 4 July 1911 in San Francisco, Fred graduated from Lick-Wilmerding High School in the middle of his senior year to enter Stanford University. There he earned his bachelor's degree in three years. For graduate study, he took Edward Condon's recommendation and chose Princeton University, where he became Eugene Wigner's first graduate student. His pioneering 1934 dissertation on sodium metal led to joint work with Wigner on understanding the cohesion of metals. Their discoveries in applying symmetry principles to formulate a quantum theory of crystals opened the way for quantitative expansion of the field. Subsequent extensions and applications of such methods have been carried out by hundreds of scientists, using increasingly powerful computational methods.

After Princeton, Fred worked successively at the University of Rochester, General Electric Research Laboratories, and the University of Pennsylvania. During that time, Fred carried out an ambitious project to, as he described it, "write a cohesive account of the various aspects of solid-state physics in order to give the field the kind of unity it deserved." The result, *The Modern Theory of Solids* (McGraw-Hill, 1940), appeared just before the US entered World War II.

At the Carnegie Institute of Technology beginning in 1942, Fred was drawn into war-related work. He consulted for a wide variety of organizations on an equally wide variety of problems, including metallurgy, silicon rectifiers, and radiation damage of solids. With Hillard Huntington, he produced the first calculation of the energies of formation and migration of vacancies and interstitials in copper. That calculation had a strong impact on subsequent work by many other experimental and theoretical physicists on point defects in metals. After the war he continued to work with Wigner at Oak Ridge National Laboratory; he directed training on the peaceful uses of atomic energy. Throughout the period after he finished his thesis, his view was confirmed that many of the most interesting and important properties of solids arise because of the atomic defects they contain.

Government support for physical science research grew significantly following the war, and Fred's landmark book inspired broad international interest among young investigators in related areas. Ultimately, *The Modern Theory of Solids* stimulated interdisciplinary collaboration among basic and applied scientists in the areas now called condensed-matter physics and materials science. Fred strongly believed that theory and experiment must advance hand in hand. The previously distinct fields of metallurgy and ceramics, electronic properties of materials, and fundamental science became increasingly linked and mutually supportive.


R. F. CARTER, ROCKEFELLER UNIVERSITY/ESVA

Frederick Seitz

Fred's unifying vision of condensed-matter physics was fully expressed in 1949, when he came to the University of Illinois to lead a major effort. He assembled people and other resources for interdisciplinary collaboration among existing departments and colleges and garnered institutional commitments to new labs and equipment and to professional and technical staff from inside and outside the university. John Bardeen was among the core group of faculty he hired. Fred became physics department head in 1957 and took the lead in establishing a materials research laboratory, which is now named for him.

He served as chairman of the board of the American Institute of Physics from 1954 to 1959 and as American Physical Society president in 1961. Along with his parallel activities, which included a year (1959–60) as science adviser to the North Atlantic Treaty Organization, Fred advised Illinois graduate students and, with the core faculty, attracted to Illinois many postdocs and senior visitors from abroad.

Altogether, his published output has contributed to many areas: spectroscopy, luminescence, plastic deformation, irradiation effects, physics of metals, self-diffusion, point defects in metals and insulators, and science policy. Fred joined with David Turnbull in planning and editing a new Academic Press book series, Solid State Physics. Started in 1955, it now has 60 volumes with 15 book-length supplements. Fred continued as an active editor until volume 38 in 1984.

Fred's interests and influence were as broad as science itself. In 1962 he was elected president of the National Academy of Sciences, which was at that time a part-time position, and in 1964 he left Illinois to become the NAS's first full-time president. There he found pressing problems in elementary-particle physics; advances in the field called for facilities beyond those of any single university. Under NAS auspices, he initiated a national consortium, the Universities Research Association. That group successfully contracted with the Atomic Energy Commission to construct and manage a new laboratory that would house the world's largest particle accelerator. He appointed a committee to evaluate the 128 submitted site proposals and recommend the six best qualified. Those moves led to the creation of Fermilab.

Also under NAS auspices, Fred initiated a broad survey, the result of which was published as *Physics: Survey and Outlook* (National Academy Press, 1966). For many years that and successive surveys have provided valuable guidance to government agencies and others that had to make difficult decisions regarding the allocation of available funds. Further, the rapidly growing fields of condensed-matter and materials physics have come to depend increasingly on major facilities that have wide user access from universities and industry; within the structure of the NAS and the National Research Council, Fred cochaired a groundbreaking national assessment of those needs.

After his stint at the NAS, Fred served for 10 years as president of Rockefeller University in New York and helped launch new research programs in molecular biology, cell biology, reproductive biology, and neuroscience. He also initiated new clinical studies at Rockefeller University Hospital and a joint MD–PhD program with Cornell University. That combination was again characteristic of Fred's view that basic science and applied work are each better off for the other's presence.

On his 1978 retirement from Rockefeller, Fred continued to serve on numerous boards and advisory committees for corporations, government organizations, and scientific societies. He expressed his interest in the history of science by writing a series of books and papers on subjects that included a history of silicon, a story of German industrial physicist Nikolaus Riehl, and a history of the NAS. Among his innumerable awards, the 1973 National Medal of Science stands at the top.

A vital contributor to Fred's scientific and public life was his wife, Elisabeth (Betty). In his autobiography, *On the Frontier: My Life in Science* (AIP, 1994), he wrote, "I think it is safe to say that, in the writing of [*The Modern Theory of Solids*], Betty, who was soon deeply involved in the program, and I became familiar with every paper related to the field." Betty's early life in China complemented Fred's international perspective and travels beautifully, and her love of the piano enriched both their lives. With a wry sense of humor, Fred was a kind and generous person, giving untold and unacclaimed time and energy to help young scientists and young science along their way.

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