William P. Slichter

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1922–1990

By David W. McCall

William Pence Slichter, retired executive director with AT&T Bell Laboratories, died at this home in Chatham, New Jersey, on October 25, 1990. He succumbed to cancer in his sixty-ninth year. Dr. Slichter's career coincided with the emergence of materials science as a recognized discipline, and he played an important role in research, development, management, and definition of the field.

Dr. Slichter was born in Ithaca, New York, where his father was a professor in the Economics Department of Cornell University. Sumner Slichter transferred to Harvard University in 1926. William Slichter grew up in Cambridge, Massachusetts, where he graduated from the Browne and Nichols School and Harvard College. Following graduation from Harvard in 1944, he entered the U.S. Army. He achieved the rank of lieutenant in the field artillery and that of captain in the reserve and saw service in the Pacific theater. He always spoke favorably of his military experience and invoked organizational principles learned there in diverse situations later in life. Upon discharge from the service in 1946, he enrolled for graduate study, again at Harvard, and emerged with a Ph.D. in chemical physics in 1950. His doctoral research was carried out in collaboration with Professor George Bogden Kistiakowsky in the area of molecular beams methodology. In those days molecular beams experiments were per formed with handmade glass apparatus, and the techniques were extremely difficult.

Dr. Slichter then elected to enter an industrial career with the Bell Telephone Laboratories as part of a new initiative in polymer research headed by W. O. Baker. The decade of the 1950s was an exciting time at Bell Labs, and Slichter lost little time in becoming a key contributor in the community. After a period of learning in the polymer area, he was called to join a team working on the processes of diffusion in semiconductor crystals. This work led in 1953 to a seminal paper with J. A. Burton and R. C. Prim in which the theory and experimental situation in regard to the distribution of impurities and desired solutes was described in useful terms. Their results were summarized in the now-classic Burton-Prim-Slichter equation, which describes the segregation of impurities during solidification as a function of experimental variables. Their findings were immediately applied to the preparation of silicon single crystals and were key to obtaining crystals satisfactory for early transistors. This became one of the building blocks of the field of semiconductor crystal growth and solid-state processing that continues until this day.

In 1954 Slichter returned to the area of high polymer studies and focused on solid-state structure and properties. The long chain nature of polymers had been discovered some years earlier, and important studies of the crystallography of polymers had been carried out by Baker and C. S. Fuller. Slichter perceived that the next essential step in understanding lay in the next higher level of molecular organization, that of polymer morphology, or specifically, the manner in which polymer crystals are organized into spherulites. The discovery and verification of chain folding in polymer lamellae in the late 1950s was a key step. (Interestingly, chain folding had been discovered at Bell Labs much earlier, in gutta-percha, but the general significance of the finding was not appreciated, and the phenomenon remained to be rediscovered by Keller in England in 1956.)

At the same time a new tool, nuclear magnetic resonance (NMR), arrived on the scene, and Slichter initiated a long-term program that provided the underpinnings for dielectric and mechanical relaxation. This work provided engineering insights that were essential in the application of polymers in communications equipment and also had great impact on polymer applications in other fields. While the morphology revolution remained largely focused on polyethylene in the 1950s and early 1960s, Slichter began to apply the principles to a wide variety of useful polymeric materials. He contributed to the experimental methodology through the development of NMR spectrometers built locally and involving the most advanced techniques known at the time.

His papers were clear and persuasive, and he was highly regarded for his ability to interpret advanced results in terms that were clear to coworkers concerned with engineering problems. For this work Dr. Slichter was awarded the American Physical Society High-Polymer Physics Prize in 1970. The prize committee recognized his contribution to the understanding of engineering properties of polymeric materials.

A large part of Dr. Slichter's career was devoted to the management of engineering and research activities within Bell Labs. He recognized early on that manufacturing processes were becoming less mechanical and more chemical, and he assembled an organization capable of supporting the design, manufacture, and maintenance of the most advanced communications equipment. He was instrumental in building organic and theoretical chemistry groups in the late 1950s and early 1960s. During the 1960s he assembled a highly regarded group covering polymer physics and chemistry, polymer engineering, and specific applications groups concerned with extruded products, molded products, adhesives, and many other classes of materials. In the 1970s he formed a chemical engineering organization well adapted to the needs of the company.

While metallurgy, ceramics, and glass technology were evolving into the other parts of materials science, Slichter assumed responsibility for the entire range of AT&T's materials activities as Executive Director of Research, Materials Science and Engineering Division, in 1973. Through his efforts the diverse branches of materials science were developed into a coherent, unified, and effective organization that successfully provided materials engineering to the design, manufacturing, and operating divi sions of AT&T. Dr. Slichter was an inspiring leader, who succeeded in bringing together effective teams to perform innovative tasks. Examples include optical fiber technology (including glass compositions and processing as well as the plastic coating), resist chemistry for electron beam production of integrated circuit masks, superior wire and cable insulation and sheathing, radiation cured distributing frame wire insulation, magnetic components for telephones, and novel alloys for connector applications, to mention only a few.

Dr. Slichter's technical and managerial skills were widely recognized; he was elected to the National Academy of Engineering (NAE) in 1976, and he was frequently asked to consult with and advise organizations other than AT&T. The following partial list of his activities will give a flavor of their importance and diversity:

Advisory Committee, Division of Mathematics and Physical Sciences, National Science Foundation

Visiting Committee on Advanced Technology, National Institute of Standards and Technology

National Academy of Engineering, Materials Engineering Peer Committee

Director, Michigan Macromolecular Institute

NAE Engineering Research Centers Assessment Committee

Committee on Major Materials Facilities, National Research Council (NRC), which reported to the White House

Board of Trustees, Gordon Research Conferences

Committee on Scientific and Technological Aspects of Materials Processing in Space, NRC

Director, American Society of Testing and Materials

Advisory Committee for Chemistry Department, Harvard University

National Materials Advisory Board, NRC

Advisory Council, National Aeronautics and Space Administration

Space Applications Board, NRC

Council of the American Physical Society

At the time of his death, Dr. Slichter's calendar contained many of these and similar commitments.

Dr. Slichter had remarkable instincts for good engineering and science. He did his homework carefully, and he knew how to deliver firm messages with kindness and tact. He thought deeply about the future, on both a corporate and national level. His managerial accomplishments were recognized by two awards in 1988: the Earle B. Barnes Award for Leadership in Chemical Research Management given by the American Chemical Society (ACS) and the Application to Practice Award of the Minerals, Metals and Materials Society.

Dr. Slichter took an active interest in education and published significant papers on the subject. His enthusiasm for engineering and science was infectious, and he influenced many young people in their career choices. He served on the ACS Committee on Professional Training for a number of years.

Beyond his many professional accomplishments, Dr. Slichter is memorable for his evident humanity. He was singularly generous with his colleagues at all levels. He was bright and friendly, and people generally gravitated to him. There was never a greater agent for inspiring high morale. His passing will be mourned by people of goodwill around the world. He was an active member of the Committee on Human Rights of the National Academy of Sciences and the Committee on Chemistry and Public Affairs of the American Chemical Society.

Dr. Slichter's wife, the former Ruth Kaple, died in 1988. He is survived by his daughters, Carol Dougherty, a chef and restaurateur in Larchmont, New York; Catherine Slichter-Aiuto, with the U.S. Department of State in New York City; Margaret Van Cott of Nantucket, Massachusetts, and two grandchildren. His brother, Charles P. Slichter, is a professor of physics at the University of Illinois, Urbana.