Arthur Robert von Hippel

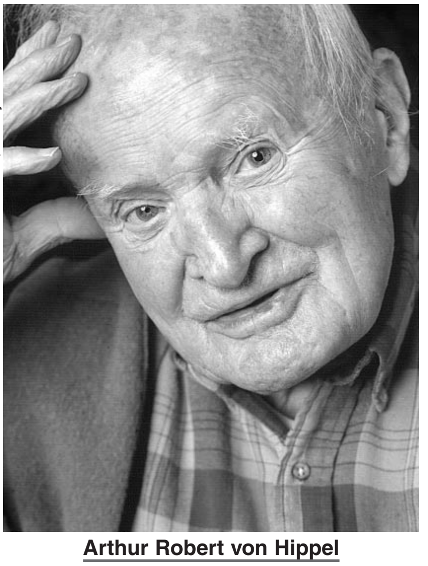
Arthur Robert von Hippel, a luminary of material physics, died at the age of 105 on 31 December 2003 in Weston, Massachusetts.

Von Hippel was born in Rostock, Germany, on 19 November 1898. Both his father and grandfather were professors in German universities: His father taught criminal law at the University of Göttingen and his grandfather, ophthalmology there. In his youth, he showed particular interest in building things, like a private lighting system for his room. He also was very interested in the outdoors and in social responsibility. Terminating his high-school education a half-year prematurely, he enlisted in the German army in 1916 to serve in the artillery during World War I. He eventually became an artillery officer and served on the southern part of the Western Front, in a mountainous area of Alsace–Lorraine.

After the war, von Hippel enrolled at Göttingen to study physics. Among his many notable teachers were David Hilbert, Richard Courant, Robert Pohl, Peter Debye, Max Born, James Franck, and Gustav Hertz. That tutelage led to his joining the Institute for Applied Electricity at Göttingen, where he did his PhD thesis on designing and building a new type of thermomicrophone, work that allowed transmission of radio broadcasts with minimal frequency distortion. On completion of his doctoral thesis in 1924, von Hippel became an assistant to Max Wien at the Physics Institute in Jena, where he worked on the sputtering of metals and showed that positive-ion bombardment released a metal from the cathode as atoms. In 1927, he spent a year at the University of California, Berkeley, to work on the ionization characteristics of mercury atoms by electron impact.

He returned to Germany to become an assistant professor, first in Jena for a year and then at Göttingen until 1933. During that period, he developed a basic understanding of electrical breakdown in gases and in crystalline solids and began his study of Lichtenberg figures, research he later returned to long after his official retirement. He married Dagmar Franck, the daughter of Nobelist James Franck. Because Dagmar was Jewish and because of his own outspoken anti-Nazi stance at the university and in the press, von Hippel and his growing family were effectively compelled to leave Nazi Germany. Fortunately, he was able to secure a professorship in Turkey in 1934. He then accepted an invitation to join the Niels Bohr Institute in Copenhagen, Denmark, and spent a year there, which allowed him time to arrange for a more permanent position. While in Denmark, von Hippel was involved in planning a high-voltage laboratory for nuclear excitation and disintegration studies.

In 1936, Karl Compton invited von Hippel to join MIT's electrical engineering faculty. Von Hippel had a distinguished career and remained active in research at MIT for more than 50 years. In 1939, he founded MIT's Laboratory for Insulation Research, where he assembled a group of chemists, physicists, and engineers to synthesize, characterize, study, and model the physical properties of a very wide range of dielectric materials. There, in 1944, von Hippel made the most important scientific discovery of his lifetime—that of ferroelectricity and piezoelectricity in barium titanate. That discovery brought him personal fame and greatly influenced the research focus of the laboratory. By the late 1950s, $BaTiO_3$ and related ceramics were in wide use as novel electric circuit elements and electromechanical transducers.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Although very much involved with basic research, he always had a deep interest in the applications. With the coming of World War II and the involvement of the US scientific community in wartime research, his laboratory became one of the major centers to develop dielectric materials for radar applications. As part of the MIT Radiation Laboratory wartime program, his laboratory produced measurement techniques and equipment to determine the temperature dependence and frequency dependence of the dielectric properties of many materials.

After World War II, the Laboratory for Insulation Research became known internationally for its pioneering studies of dielectrics, semiconductors, ferromagnets, and ferroelectrics; for von Hippel's interdisciplinary approach to materials research; and for promoting collaboration among scientists to solve fundamental materials problems from the atomic to the nanostructural to the microstructural levels. The laboratory's success in problem solving, training many young scientists, and setting up shared research facilities, along with the experiences of other institutions during the wartime years, greatly influenced the way materials physics was pursued worldwide in the postwar era.

Von Hippel's books on the structure and properties of dielectrics also had an impact on materials physics because of their breadth and depth. He was a visionary regarding research trends and, in his later years, moved into the study of biophysics. Arguably, his vision about the importance of an interdisciplinary approach to materials physics and its success in terms of problem solving and educational impact was important for the creation of the national program of federally sponsored materials research laboratories, first by the US Department of Defense (1960–72) and later by NSF (1972 to present), and subsequently by other countries.

Although von Hippel drove hard to achieve research results, he found time for daily exercise, art, and music, and for his friends from around the world. He also felt compelled to involve his students, friends, and collaborators in those broader aspects of life and culture. My first meeting with him came through music and music making. I had the pleasure of being involved in many musical events inspired by von Hippel. Especially notable were the chamber music events centered around his birthdays, especially his 75th, 90th, and 100th birthday celebrations.

Von Hippel greatly enjoyed the outdoors and often invited members of the laboratory to join him on weekend skiing trips. In his later years, he invited friends and former associates to join him on his daily vigorous walks in the woods, rain or shine; I remember with delight and amazement some of those excursions when he was well into his nineties. On the walks, he would often act as a mentor, sharing experiences with me about running large laboratories in an effort to help me to successfully run the MIT Center for Materials Science and Engineering. His devotion to the outdoors and exercise contributed to his own high energy level, to his long and active research career that stretched well into his eighties, and to his long life.

On the personal side, von Hippel was devoted to his wife and life partner, to his four sons and daughter, and to his grandchildren. One family thread that struck me was the large concern his offspring have for making the world around them a better place.

Mildred S. Dresselhaus
Massachusetts Institute of Technology
Cambridge

Anthony Houghton

Anthony Houghton, a world-renowned theoretical condensed matter physicist, died of cancer on 28 July 2003 in Providence, Rhode Island.

Born on 4 October 1935 in Heanor, England, Tony received a BSc in mathematical physics from the University of Birmingham in 1956. His 1959 PhD thesis, "Non-Perturbative Approach to Impurity Resistance in Metals," was conducted at Birmingham under the supervision of Geoffrey Chester in the group of Rudolph Peierls. Tony carried out postdoctoral research at the Carnegie Institute of Technology (now Carnegie Mellon University) in Pittsburgh, Pennsylvania; the University of California, San Diego (UCSD); and at McMaster University in Hamilton, Ontario.

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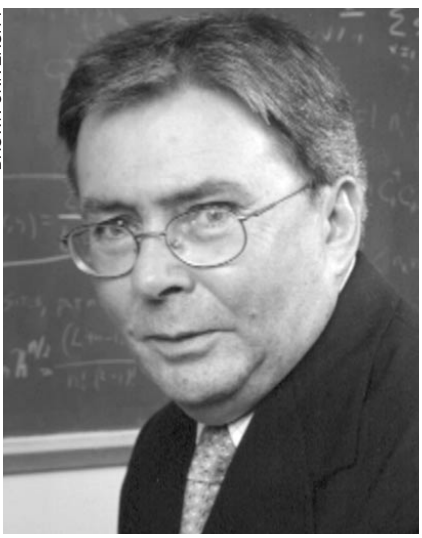

Anthony Houghton

In 1963, Tony joined Brown University in Providence as an assistant professor in the physics department and rapidly rose through the academic ranks. During his career at Brown, he made many lasting contributions to condensed matter physics as the single author and coauthor of more than 90 papers. His early work focused on aspects of the Bardeen-Cooper-Schrieffer theory of superconductivity, including ultrasonic attenuation. In a well-known collaboration in 1973 with Franz Wegner, then at the Institut für Festkörperfoschung, KFA Jülich, Germany, Tony made an important contribution to renormalization group theory by developing a differential form of the recursion relations.

During the 1980s, Tony turned to the physics of strongly correlated electrons and carried out pioneering work on the use of the $1/N$ expansion to describe the Anderson impurity model. After the 1986 discovery of high-temperature superconductors, Tony worked with collaborators to develop a theoretical description of the melting of the vortex lattice; that description provided excellent agreement with experimental data.

Much of Tony's attention during the 1990s was devoted to the physics of fermion liquids. Alan Luther and Duncan Haldane showed that bosonization could be extended to dimensions greater than one, and Tony spent much of that decade exploring the ramifications of those ideas. During that period, he also was Brown's physics chair (1992–98).

Tony held visiting professorships at many European and American institutions, including Oxford University and UCSD. He held Science Research Council fellowships and, in 1977, won an Alexander von Humboldt Senior Scientist Award.

Tony was a superb teacher and mentor to his students and junior colleagues. He taught a wide range of classes, from introductory pre-med to many-body theory, and prepared and delivered his lectures with the utmost care and diligence. Throughout his life, Tony ventured into new physics with the energy and determination of a young person just starting in the field, and he did not take the easy way out. He worked through every complicated calculation himself and understood each detail of all of his collaborative efforts, whether with his students or other researchers. Colleagues would pass by his office and see him bent over his desk doing page after page of calculations to fill in the details of important papers in an