

knowing the interphase surface areas and how they change during catalyst preparation and use is extremely important.

A desire for conciseness and clarity informed Harry's teaching. He took whatever time was needed to explain a difficult point to a student or colleague. Although his talents for deflating pomposity and signaling unclear thinking in others did not endear him to everyone, his teaching and advising were appreciated by his students. Furthermore, colleagues worldwide sought his advice on scientific and other matters. Correspondence from Harry was a great pleasure to read, both because of the elegance of the writing style and the intelligent content. An often-invited speaker at international conferences, he remained active as a member-at-large of the small-angle scattering special interest group of the American Crystallographic Association.

His last research project involved small-angle scattering measurements on metal-zeolite systems, performed at the Cornell High Energy Synchrotron Source in 1999. The intensity of the source permits measurement of an entire scattering curve in seconds or minutes. This measurement allowed Harry to study the changes when a zeolite, impregnated with a platinum-ammonia compound, is exposed to reducing and oxidizing atmospheres in turn for several minutes at a time, as happens in catalyst preparation. In 1996, he established that sintering of metal particles (which should be avoided because it decreases surface area) occurred during calcination (oxidizing atmosphere), but could be minimized if the calcination was performed slowly at temperatures low enough for the ammonia to be lost without decomposition.

Harry retired from the chemistry department at Syracuse in 1995. However, he remained active in research, which he did on small-angle x-ray scattering from solid catalysts. In April 1996, Syracuse awarded him the title of research professor in chemistry. He continued to teach at the university and at SUNY's environmental science and forestry college, located in Syracuse. One month before his death, he was involved in the planning for a colloid chemistry course, which he loved to teach, at Syracuse.

Harry was a gentleman and a scientist. A truly educated and learned man, he was widely read and often impressed others by his knowledge. He was particularly interested in history. In the months before his death,

he studied Latin so that he could study some of the alchemical texts in the original language.

A few weeks before Harry's death, a reporter for a Syracuse newspaper interviewed him for a story about the Cornell synchrotron. Harry told him about the joys of scientific research and how they justified all the hardships, such as all-nighters when beam time was available. He spoke of the "fascination about it" and ended with "I have pages and pages of . . . experiments we would like to do."

Harry's devotion to his research is one of the things we will long remember. We will miss his elegance, wit, and erudition, qualities that made him a great colleague and friend whose absence saddens us.

JERRY GOODISMAN

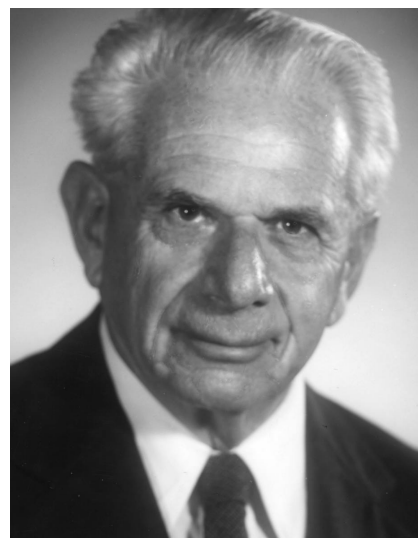
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ARNOLD BORIS ARONS

he moved to Amherst College as a professor of physics. At Amherst, Arnold was widely known as a skilled teacher and was one of the subjects of a *Time* magazine cover story on education (6 May 1966). Recognizing the inadequacies of traditional physics instruction at the time, Arnold developed a calculus-based introductory course as the science component of a core curriculum required of all freshmen. Through his teaching, he brought to the course historical, philosophical, and humanistic perspectives. His first textbook, *Development of Concepts of Physics* (Addison-Wesley, 1965), grew out of this experience.

In 1968, Arnold was invited to join the faculty at the University of Washington, where he initiated an introductory physical sciences course for preservice elementary school teachers. From 1969 to 1975, he directed NSF summer institutes for in-service elementary school teachers. During this period, the program was expanded to include teachers of high-school physics. The work with teachers led to the establishment of the Physics Education Group at the University of Washington, widely known for its role in teacher education and its leadership in the field of physics education research. After his retirement in 1982, Arnold continued to lecture, conduct workshops, and write extensively on the teaching of physics.

Throughout his career, Arnold reflected on the intellectual challenges involved in learning physics, and he set exceptionally high standards for himself and his colleagues. He played a unique role in raising awareness that introductory physics courses are often ineffective in helping students develop conceptual

Arnold Boris Arons

Arnold Boris Arons, an internationally recognized pioneer and leader in physics education and a professor emeritus of physics at the University of Washington, died suddenly of a heart attack at his home in Seattle on 28 February 2001.

Born on 23 November 1916 in Lincoln, Nebraska, Arnold grew up in New Jersey and received an ME degree in 1937 and an MS in chemistry in 1940, both from the Stevens Institute of Technology. He obtained his PhD in physical chemistry in 1943 from Harvard University, where he worked with E. Bright Wilson Jr on a study of shock waves produced by underwater explosions.

During World War II, Arnold was a group leader in the Underwater Explosion Research Laboratory at the Woods Hole Oceanographic Institution, beginning an association with Woods Hole that lasted throughout his lifetime. He was well known for his studies of abyssal oceanic circulation and cloud physics with Henry M. Stommel and Alfred H. Woodcock and for experimental and theoretical work on phase distortion of acoustic pulses reflected from the seabed.

In 1946, Arnold accepted a position as an assistant professor of physics at the Stevens Institute of Technology. He remained there until 1952, when

understanding and scientific reasoning skills. Arnold maintained that it is necessary for faculty to listen carefully to students in order to be able to match instruction to the students' evolving level of understanding. He was a strong proponent of Socratic dialogue as a means of promoting meaningful student learning.

Through his many articles and books, Arnold provided the physics community—and the educational community as a whole—with a permanent legacy of extraordinary quality. Especially through his books *The Various Language: An Inquiry Approach to the Physical Sciences* (Oxford U. Press, 1977) and *A Guide to Introductory Physics Teaching* (Wiley, 1990), Arnold had a strong influence on the development of innovative curricula and on the teaching of physics by individual faculty members.

In addition to his contributions to physics education, Arnold served the physics community in other important ways. From 1961 to 1968, he was the first editor of *Resource Letters*, a series that is periodically published in the *American Journal of Physics*. In 1967 and 1968, he was president of the American Association of Physics Teachers. AAPT awarded him its highest honor, the Oersted Medal, in 1973.

Arnold served on a number of national committees, including the NSF commission on college physics (1962–68). From 1963 until his death, he served the Woods Hole Oceanographic Institution in both active and honorary capacities as a member of the corporation or as a trustee. He also was a member of the American Institute of Physics governing board from 1966 to 1972.

Arnold read widely and his intellectual curiosity extended beyond physics. His keen mind and extraordinarily sharp memory enhanced his appreciation of the arts. He memorized reams of poetry that he could recite spontaneously. He greatly enjoyed music and spent many hours in art galleries. Arnold and his wife Jean loved to hike in the mountains. They traveled extensively in Europe, especially in England and Wales. Arnold would engage his friends with eloquent reports about his experiences. His presence, his guidance, and his thoughtful insights will be greatly missed.

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