# Barbara Hope Cooper

*September 1, 1953 — August 7, 1999*

Barbara Hope Cooper, a leader in surface science and the first woman to be appointed a Professor of Physics at Cornell University, died of lung cancer on August 7, 1999 in Ithaca, New York.

Born in Lancaster, Pennsylvania on September 1, 1953, Barbara graduated from Cornell in 1976 with a B.A. degree in Physics and went on to earn a Ph.D. degree in Physics from Caltech in 1982. She remained at Caltech as a Postdoctoral Fellow until 1983, when Cornell's Physics Department recruited her to be an Assistant Professor. She became a full Professor in 1965.

Barbara is best known for innovative experimental studies of the scattering and trapping of low-energy ions at metallic surfaces. She began as a novice in this research field in 1983, with an empty laboratory and relatively little support, but within a few short years she had created one of the leading laboratories. She and her students designed and built a versatile ion scattering apparatus that could operate at ion energies from 10 to 1000 eV. With this apparatus, detailed information about the scattering potentials, energy transfer processes, scattering mechanisms, and the role of surface adsorbates was obtained from measurements and simulation of the energy and angular distribution of alkali and oxygen ions scattered from copper (100) and (110) surfaces.

She obtained particularly important results from scattering processes in which electron transfer occurred when the ion was near the surface. In addition to carrying out the experiments, she launched a parallel program in large-scale trajectory simulation using accurate potentials and systematically incorporating many-body effects. This initiative gradually led to a new understanding of the role of correlation effects in charge transfer processes and to a far deeper appreciation of these inherently complex dynamical phenomena.

More recently, Barbara extended her research program to investigate the manner in which low-energy ion bombardment affects the erosion and growth of metal surfaces and in thin film deposition. She used an *in situ* scanning tunneling microscope to gain atomic-resolution images coupled to real time and in situ synchrotron x-ray scattering to gain low-angle diffraction data for the surface structure during ion bombardment. She was able to observe pattern formation during sputtering of a gold surface and then to probe the competition between roughening and smoothing mechanisms during sputtering and annealing.

Throughout her career, Barbara had a keen eye for potential technological opportunities resulting from her research. However, always closest to her heart was a deep devotion to fundamental science. She was a superb research supervisor and successfully guided a dozen students through their Doctorates at Cornell.

Her impact went far beyond her own research group. In recent years, her scientific leadership talent for organizing large, diverse groups was increasingly vital to two of Cornell's multidisciplinary research centers, the Cornell Center for Materials Research (CCMR) and the Cornell High-Energy Synchrotron Source (CHESS). She was also a key leader in an initiative now under way to build a new facility at Cornell's CHESS that will provide a unique, dedicated x-ray facility for materials research.

Barbara's talents were widely recognized in the national and international physics communities. She received a Presidential Young Investigator Award from the National Science Foundation (1985-89), and faculty development awards from IBM and AT&T. She received the American Physical Society's Maria Goeppert-Mayer Award in 1992.

A truly dedicated teacher, she worked to develop more hands-on investigation of fundamental scientific concepts in several introductory physics courses at Cornell. Her eight-year-old daughter, Katie, inspired her to take a special interest in educational outreach programs introducing elementary school students to the wonders of science.

Barbara will be enduringly remembered for her dedication to science, her quiet and effective leadership skills, and her insight and courage to invent and develop new experimental methods. Her untimely death continues to affect all of us who had the great privilege of knowing her.

*Douglas Fitchen, Wilson Ho, Neil Ashcroft*