



IN MEMORIAM

Sheldon K. Friedlander
Professor of Chemical Engineering
UC Los Angeles
1927 – 2007

At the time of his death on February 9, 2007 at his home in Pacific Palisades, Sheldon K. Friedlander was UCLA Parsons Professor of Chemical Engineering and Director of the Air Quality/ Aerosol Technology Laboratory. He is best known for his research on the various pollutants in smog and their quantification by source. Born November 17, 1927, in New York City, Shel was the only child of Irving Friedlander, a paper box manufacturer, and his milliner wife, Rose. He interrupted his undergraduate studies at Columbia University to serve in the Army just after World War II but returned to earn a bachelor's degree in chemical engineering in 1949, a master's from the Massachusetts Institute of Technology in 1951, and a PhD from the University of Illinois in 1954. For most of his scientific career, Shel's field was the science and technology of very small particles, particularly aerosols. In 1950-51, Shel was hired as a Research Fellow by the Harvard School of Public Health on an Atomic Energy Commission contract. They were concerned about the escape of radioactive particles from nuclear reactors. His academic interest in the air pollution aspects of aerosols began with this important problem.

Shel's first professorial appointment was with Columbia University in 1954. In 1957, he moved to the Johns Hopkins University Chemical Engineering Department. Following his first year at Hopkins, he drove to New York, where his mother gave him the phone number of a young woman to call, and the address of a party hosted by her sister. He met that young woman, Marjorie Robbins, at the party; and eight weeks later, they were married.

In 1964, Shel moved to Caltech. There in the 1970s, he devised a way to analyze existing data that measured the chemical makeup of smog particles. By doing so, he was able to unravel who or what (including power plants, automobiles and oil refineries) was contributing to air pollution at any given time. That in turn helped governments more finely hone their environmental regulations. "Sheldon was able to point the finger directly at the source," said a former colleague, Richard C. Flagan, Professor of Chemical Engineering at Caltech. "Before that, you knew different industries were releasing different particles. But he could say what the relative distribution of different sources of pollution were."

Shel came to UCLA in 1978 as a founding member of the Chemical Engineering Department, and served as Chair from 1984-1988. In 1982, he helped found the American Association for Aerosol Research (AAAR); and in 1997, AAAR established the Friedlander Award, recognizing an outstanding dissertation by a doctoral student in the field of aerosol science and technology. Shel founded the Air Quality and Aerosol Technology Laboratory in 1983 and served as Director. In the mid-1980s, the lab's pollution detectives were searching for easier and cheaper ways to trap smokestack emissions and prevent pollution. Shel said, "We must find ways to control toxic wastes before they are produced, rather than ways of disposing of them afterward." In 1987 at UCLA, he secured a grant from the National Science Foundation to establish the nation's first engineering research center devoted to solving the problem of hazardous waste generation and management; he served as the Center's director for several years.

In 1996, while looking at how tiny particles are produced in coal combustion, Shel discovered that one of the biggest unknowns was the behavior of particles composed of about 100 or 1000 molecules. The particles that people had been concerned with were much bigger than that, composed of millions of molecules. Shel's

group worked on the generation of titanium particles and found that they band together to form chains. Further, they showed that these chains could be stretched and would retract upon stress release. This discovery suggested that such particle chains could be used to produce ceramic materials with some of the properties of rubber. The dynamics of strained nanoparticle chain aggregates developed into a new field of great potential importance to the synthesis of high- performance nanocomposite materials.

Recently in December 2006, he was awarded a three- year contract with the Defense Threat Reduction Agency to test his ideas on ways to defend against chemical and biological terrorism attacks, yet another direction for his particle research. His remarkably fertile mind and unusual passion for research were always evident to those who worked with him, including his faculty colleagues and the many students, postdoctoral fellows and visiting scholars who spent time in his lab. He was a committed and generous mentor who took great pride in the accomplishments of his former students and postdocs. His enthusiasm for research carried over naturally to the classroom, and he created new courses in mass transfer, air pollution, nanoparticles, and aerosol technology. He also authored the classic text, *Smoke, Dust and Haze: Fundamentals of Aerosol Dynamics*, now in its second edition.

Throughout his career, he received numerous distinctions for his seminal contributions and pioneering work in the field of aerosol science and technology, including a Fulbright Scholarship (1960), a Guggenheim Fellowship (1969), the Colburn Award (1959), the Alpha Chi Sigma Award (1974), the Walker Award (1979), the Fuchs Memorial Award (1990), the Lawrence K. Cecil Award (1995), the Christian Junge Award (2000), the Lifetime Achievement Award of the AIChE Particle Technology Forum (2001), and the Aurel Stodola Medal (ETH Zurich, 2004), as well as many honorary lectureships. He was elected to the National Academy of Engineering in 1975 in recognition of his work on the origins and control of particulate pollution.

Shel delighted in trout fishing in small streams in the Angeles National Forest, and in attending lectures at the Getty Museum. He collected stamps, Persian rugs, and tile top tables. He enjoyed listening to Frank Sinatra, Mel Tome and Lester Young. He sang popular songs of the 1930's and 40's or played them on his clarinet and was a great dancer. He refused to go to Disneyland, which he viewed as a vacation destination, and rarely traveled unless he was invited to lecture. He rarely watched TV but laughed heartily watching "Get Smart." He was surprised to find his name on a list of enemies during the administration of President Nixon. Biographies of Newton, Einstein and Niels Bohr, and the essays of Montaigne were some of his favorite reading.

In addition to his wife, Marjorie, he is survived by four children: Eva Friedlander (Duane White), Amelie Yehros (Ilan Yehros), Zoe Friedlander (Barry Greenberg), Josiah Friedlander (Katrinka Wolfson); and eight grandchildren: Zach and Lena White; Isaiah, Sam, and Ella Yehros; and Aaron, Rose, and Jack Greenberg.

Hal Monbonquette