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Arnold M. Karo

Arnold M. Karo died on 16 June 1991 at age 63, after a yearlong battle with leukemia. He was a theoretical chemist and solid-state physicist with the chemistry and materials science department at Lawrence Livermore National Laboratory.

Karo received bachelor of science degrees in both chemistry and physics from Stanford University in 1949 and his PhD degree in physical chemistry from MIT in 1953. Following a period of employment on the research staff of the solid-state physics division of MIT's Lincoln Laboratory, he spent two years with the US Army Chemical Corps at the Dugway Proving Ground, Utah. During that time he was also associated with the University of Utah as a lecturer in the department of chemistry. In 1955 he joined the solid-state and molecular theory group in the department of physics at MIT as a postdoctoral fellow.

In 1958 Karo joined Livermore as a theoretical chemist and solid-state physicist. While there he did pioneering work in atomic and molecular orbital theory; the solid-state physics of specific lattice dynamic models; the theoretical investigation of infrared absorption and Raman scattering properties of crystals, leading to the first detailed calculations relating structure in the observed spectra to critical features of the phonon densities of states; and the development of techniques used in quantum chemistry in calculations of the electronic structure of molecules. He also organized and headed a theoretical chemistry group.

More recently Karo worked on the vibrational relaxation of hydrogen molecules upon impact with a cold metal surface and the recombination of hydrogen molecular ions on surfaces into vibrationally excited hydrogen molecules. This work has been crucial to understanding the kinetics of hydrogen (deuterium) negative-ion generators.

In parallel with this later work Karo pioneered in the application of molecular dynamics to the study of shock-induced behavior in condensed matter, including initiation and detonation phenomena in energetic (explosive) materials.

Karo's capabilities as a scientist were matched by his human qualities. The term "gentleman" seems to come first to most colleagues' minds when asked to describe him, and he did much of his work as part of several long-term collaborations. A result of one such collaboration, with John Hardy, was the book *The Lattice Dynamics and Statics of Alkali Halide Crystals.*

All of us will miss Arnold and the insight he provided—both in scientific matters and in our relations with our fellow humans. One always anticipated with pleasure a scientific discussion with him in his office or by telephone, or a social evening in his home. It is hard to realize that this is no longer possible.

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