

from crystals.

In the early 1940s, he introduced punched-card methods to cope with the laborious calculations that crystallography often entailed. Consequently, the Caltech crystallography group was in a position to analyze crystal structures, such as those of amino acids and simple peptides, at a higher level of complexity than was previously possible. Schomaker's 1967 paper with Kenneth Trueblood on the analysis of molecular rigid-body vibrations in crystals is a classic. Until his last days, he worked with Trueblood on a long-planned sequel to this paper (on the quadratic correlation among rigid-body and internal vibrational motion), a work that was completed by Trueblood only weeks before his own death earlier this year.

Schomaker was possessed by a passion to get things right. He often saw that something taken for granted might not in fact be true, and he could worry about such questions for years until he got to the bottom of them. He was opposed not only to sloppy thought but also to sloppy writing. He wrote papers at an agonizingly slow rate because he scrutinized every sentence over and over again until it expressed exactly what he wanted to say. In argument, despite his seemingly gentle manner, he could be disconcertingly forthright ("Goddamn it, Jack, how can you be so goddamn stupid!"), but he was also more than generous in giving credit for even the most minimal contribution of his discussion partner. And if he was severe with the stupidity of others, how much more severe he was with himself! If he caught himself out in some intellectual error or blindness, he could be furious with himself for days.

After I left Caltech in 1954, our paths diverged. In 1965, I was a visitor at Iowa State College and heard that Schomaker, driving from the East

Coast to Seattle, would pass through Ames, Iowa. One afternoon, he was waiting for me in my little office. He looked me in the eye and began: "Jack, when we last talked, you said. . . . Now, I've been thinking about that and come to the conclusion that what you said cannot be quite correct." What it was all about, I had long forgotten, but not Verner—even after eleven years!

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Kenneth Nytray Trueblood

Kenneth Nytray Trueblood, a leading crystallographer and chemist who taught at UCLA for 49 years, died at home in Los Angeles on 7 May. The cause was cancer.

Trueblood was born in Dobbs Ferry, New York, on 24 April 1920. He earned an AB at Harvard University in 1941 and a PhD at Caltech in 1947—both in chemistry. Influenced at Caltech by Linus Pauling, Trueblood became a crystallographer and set out from there on his life's work of determining the structures of molecules.

In 1949, after a two-year research fellowship at Caltech, Trueblood joined the UCLA chemistry faculty as a temporary instructor. Rising through the faculty ranks, he served as chair of the department (1965–70, 1990–91), dean of the College of Letters (1965–70) and chair of the academic senate (1983–84). Throughout this entire period, Trueblood continued the classroom teaching that he loved and pursued his research on the three-dimensional structures of molecules, using x-ray diffraction as a tool.

A pioneer in the use of computers to determine structures, Trueblood wrote with Stanley Mayer one of the first papers on the subject from a US laboratory. Trueblood's computational expertise contributed to the Nobel Prize discoveries of several others, including those of his long-term collaborators Dorothy Hodgkin and Donald Cram. In 1965, with his student Robert Long, Trueblood developed the first widely used computer program for determining crystal structures by direct methods. Trueblood was also interested in crystalline disorder. In the 1980s, with Jack Dunitz and Verner Schomaker, he provided fundamental interpretations of molecular motions in crystals.

After retiring from teaching, Trueblood remained active in research, and he completed the last of his some 140 research papers—on the rigid-body motion of molecules in crystals—just be-



KENNETH NYTRAY TRUEBLOOD

fore his death.

For his contributions to crystallography, he was honored with a Fulbright award for study at the University of Oxford (1956–57), a Guggenheim fellowship for research at the Swiss Federal Institute of Technology (1976–77) and the Fankuchen Memorial Award of the American Crystallographic Association (1995). He was elected president of the American Crystallographic Association in 1961.

Trueblood was unusual in excelling in all three areas of academic life: teaching, research and administration. For his profound influence on beginning chemistry students, he received the first UCLA Distinguished Teaching Award in 1961 and the 1978 National Award for Excellence in Teaching given by the Manufacturing Chemists Association. Not limited to teaching in the classroom, Trueblood's educational endeavors included writing, with Jenny Glusker, *Crystal Structure Analysis: A Primer* (Oxford University Press, 1972).

Trueblood's administrative talents revealed themselves in his organization of a departmental x-ray crystallography laboratory that was used by organic and inorganic chemists—rather than by crystallographers alone—to solve chemical structure problems. This departmental crystallographic laboratory was a model copied by many chemistry departments throughout the world.

His success in teaching and administration was rooted in his combination of modesty and interest in the well-being of others that conveyed a feeling of integrity to all who met him. He seemed always to see the best in others, and they responded to his expectations. Often, he would work alongside his research students all night.

He also possessed a phenomenal memory for both chemicals and people.

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CHARLES DAY

Upon running into former students who had been in one of his large classes years before, he would often astound them by greeting them by name.

He was an avid fan of the New York Yankees and of all UCLA sports teams.

DAVID EISENBERG

University of California, Los Angeles

JENNY GLUSKER

Institute for Cancer Research

Philadelphia, Pennsylvania

ROBERT SPARKS

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Norman Paulson Heydenburg

Norman Paulson Heydenburg, who was probably best known for his midcareer work on Coulomb excitation, died on 20 March, in Tallahassee, Florida.

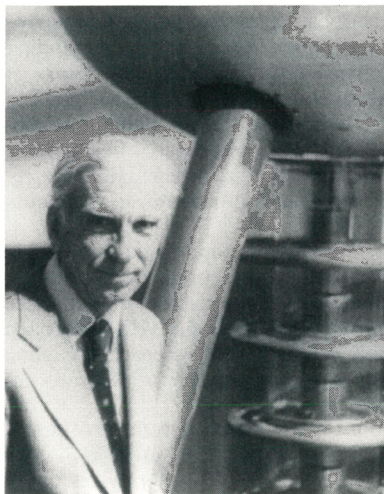
Born on 8 June 1908 in Big Rapids, Michigan, Heydenburg earned a BA degree from Olivet College in 1930 and a PhD in physics from the State University of Iowa in 1933.

After graduation, he held a National Research Council fellowship at New York University, where he continued his dissertation work on the measurement of nuclear moments from the polarization of resonance radiation. In 1935, he moved to the University of Wisconsin, where he began studying nuclear physics using electrostatically accelerated beams.

Later that year, he joined the staff of the Carnegie Institution's Department of Terrestrial Magnetism in Washington, DC. At that time, Merle Tuve and Lawrence Hafstad were beginning experiments at Carnegie that would determine the nuclear component of the force between two protons. The following year, Tuve, Heydenburg and Hafstad reported their results in the *Physical Review*, alongside Breit, Condon and Present's theoretical analysis of the experiments. Together, the two papers showed conclusively that the nuclear force was attractive. Complementary measurements at about the same time by Tuve and Hafstad on the scattering of neutrons by protons established that, except for the effect of the proton's charge, the neutron-proton force is identical to the proton-proton force.

By 1941, Heydenburg and his collaborators had examined the production of nitrogen-13, discovered radioactive beryllium-7 and, with Brookes Roberts and Norman Ramsey, studied the scattering of deuterium-deuterium, proton-helium and deuterium-helium.

Heydenburg's nuclear physics work was interrupted by the entry of the US



NORMAN PAULSON HEYDENBURG

into World War II. He and Tuve joined a group at Johns Hopkins University that was working on proximity fuses.

After his return to the Carnegie Institution in 1946, Heydenburg expanded his studies of nuclear reactions in light nuclei with his 3 MeV Van de Graaff generator. For more than a decade of blossoming excitement in nuclear physics, he worked there with, among others, David Inglis, Dexter Whitehead, Emmett Hudspeth, Charles Swann and Gerald Phillips.

Starting in 1953, Heydenburg began to collaborate with Georges Temmer on the excitation of low-lying nuclear states by alpha particles. It had been suggested that the nuclear quadrupole moments of deformed nuclei should interact strongly with the transient electric field of alpha particles at bombarding energies well below the Coulomb barrier. Using Carnegie's Van de Graaff accelerator with the newly developed NaI(Tl) scintillation gamma-ray detector, Heydenburg and Temmer measured gamma-ray transitions emitted following Coulomb excitation and helped determine the nuclear structure for previously inaccessible low-lying states. Their rollicking series of experiments, in which almost every day saw results for a different isotope, was beautifully summarized in their 1956 review "Excitation of Nuclei by Charged Particles" (*Annual Reviews of Nuclear Science*, volume 6, page 77).

Heydenburg and Temmer's collaboration, begun just after Temmer's arrival in Heydenburg's laboratory in 1951, continued after they both took leave of absence from Carnegie in 1960 to help organize and direct a new lab at Florida State University that was built around one the first tandem Van de Graaff generators. Heydenburg's new faculty colleagues at FSU received

his patient guidance during an important time in their careers.

In 1962, Heydenburg resigned from Carnegie and became a professor at FSU. There, he supervised his own graduate students and postdocs and taught a course in atomic physics. In addition, he and his wife Katherine joined in a variety of community activities.

He served as interim director of the T. W. Bonner Nuclear Laboratory at Rice University in 1967 while on leave from FSU, and chaired the FSU physics department for six years after his return. He was also provost of arts and sciences at FSU for the nine months before his retirement in March 1974.

Heydenburg was happiest when working in a small group on the multitude of tasks that physics experiments entail, but he was just as capable of supervising a large modern laboratory. His affable nature, which gave him an understated demeanor, coexisted comfortably with his strong opinions. And his mentoring of young researchers has had a lasting impact on a generation of nuclear physicists.

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Jens Lindhard

Jens Lindhard, a professor of physics at Aarhus University, in Denmark, died on 15 October 1997 after a normal day at the university's Institute of Physics, where he had worked for the last 40 years. Lindhard succeeded his mentor Niels Bohr as a leading figure in particle-solid interactions, but his most widely known contribution to physics is his study of the electron gas. He showed that the electromagnetic response of the electrons is contained in the Maxwell equations for the classical field and derived the dielectric function that is now known as the Lindhard function.

Lindhard was born in Tystofte, Denmark, on 26 February 1922 and studied physics during World War II—first at Niels Bohr's institute in Copenhagen and later with Oscar Klein in Stockholm. He earned an MSc in physics from Copenhagen University in 1945. His early work with Klein on the electromagnetic response of electrons in solids, including superconductors, culminated in 1954 with the publication of a now-classic treatise "On