

oped by J. Beverly Oke for the five-meter telescope at Palomar Observatory. Use of the scanner enabled him to investigate the properties of very faint main-sequence stars, including the metal-poor subdwarfs of the halo population. Perhaps the most fascinating of the subdwarfs is the dwarf carbon star, G77-61, analyzed by Jesse and five others in 1986.

Jesse's last research paper, entitled "An Atlas of Optical Spectra of White Dwarf Stars," which he coauthored with six others, was published in the *Publications of the Astronomical Society of the Pacific* in 1993.

One of Jesse's finest characteristics as a thesis and general research adviser was his ability to imbue younger people with the self-confidence to become independent scientists. It is particularly important nowadays to recognize the value of such encouragement, especially when new postdocs join groups of 20 or 30 scientists on a single project, yet a postdoc's name likely will not be listed as first author unless it happens to begin with an A.

Jesse was a member of many government advisory committees, including one whose purpose was to evaluate whether nuclear weapons should be used to break the stalemate in the Korean War. The committee advised against such use, I am pleased to note, given that I was not far from the front lines at the time.

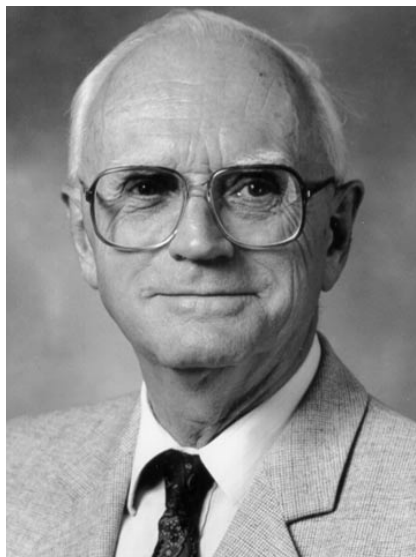
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John Peter Hobson

On 17 February 2003, John Peter Hobson, a world-renowned expert in the fields of vacuum science and technology and surface science, died suddenly at his home in Ottawa, Ontario, Canada.

Peter was born in Ahmednagar, India, on 25 October 1924. His father, a native of Ireland, was a police officer in the Raj; his mother, a native of Canada, had taught at the University of Saskatchewan before marriage. In 1932, Peter's parents sent him to boarding school in Ireland, where he was joined by his brother in 1935. In May 1940, his mother went from India to Ireland and sailed with the two boys across the U-boat-infested Atlantic Ocean to the safety of Canada.

After attending high school in Vancouver, British Columbia, Peter joined the Canadian army in 1942, was trained as a radar technician, and was sent to the Pacific theater. When World War II ended, he entered the



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University of British Columbia and obtained an MASc in engineering physics in 1950.

Peter then went to the University of California, Berkeley, for his PhD. There, he measured the spin of rubidium-81, which has a half-life of only 4.7 hours. To transfer the sample quickly into the atomic beam apparatus, he had to design a vacuum loader—his first foray into vacuum technology.

In 1954, Peter joined the National Research Council of Canada in Ottawa, where he spent 32 years. In 1969, he was appointed head of the electron physics section, which was part of the radio and electrical engineering division. He became assistant director of the division in 1981 and retained that position four years later in the newly formed microstructural sciences division.

Despite his administrative duties, Peter maintained his personal research throughout his career at NRC. His initial research, in 1954, concerned the reflection of very slow (less than 40 eV) electrons from metal surfaces. Allowing sufficient time to make measurements required very low pressures to ensure that the metal surfaces remained clean at the molecular level. Ultrahigh vacuum was in its infancy: Daniel Alpert had announced the Bayard-Alpert gauge, which initiated reproducible UHV only four years earlier, and little UHV equipment was commercially available. The electron physics section had recently started a program to develop UHV techniques, and Peter's contribution was to investigate cryopumping methods using liquid helium as a coolant. That effort led him to study

the operation of vacuum gauges at UHV pressures using liquid-helium-cooled cryopumps. Peter tested the original magnetron cold-cathode gauge, which had been developed in the section, down to 10^{-12} torr. A version of that gauge was used in the Explorer 17 satellite in 1963; an improved version was later sent to the Moon on the Apollo 12 mission in 1969 to measure the pressure of the lunar atmosphere and was also sent on Apollo missions 14 and 15 in January and June 1971, respectively.

The other major offshoot of Peter's work on helium cryopumping was a lengthy study of physical adsorption isotherms of helium, nitrogen, argon, krypton, and xenon over a very wide range of pressures from 10^3 to 10^{-11} torr. He was able to show that most of those data could be fitted to the Dubinin-Radushkevich isotherm. He also developed a new method of determining heterogeneous binding-energy distributions from physical adsorption isotherms. Peter's work on the physical adsorption of gases on heterogeneous surfaces at submonolayer coverage has had a profound impact on our understanding of physical adsorption with applications to cryopumping, particularly in accelerators and storage rings.

Peter continued his work on UHV technology for many years. In 1964, he created the lowest pressure ever measured, a record that still stands today, of about 10^{-14} torr in an aluminosilicate glass system pumped by a liquid-helium-cooled cryopump. He also performed many experiments to establish the physical and chemical processes limiting the lowest pressures obtainable in UHV systems. As a result of his studies on thermal transpiration, Peter invented the accommodation pump in the early 1970s.

The accommodation pump developed a pressure difference between two glass vacuum chambers at room temperature joined by a U-shaped glass tube immersed in a suitable coolant; the surface of one arm of the U-tube was roughened (leached) and the other arm was smooth (fire polished). The proposed mechanism is speculative, but involves non-cosine distribution of gas molecules scattered at the surfaces. In the late 1970s, he participated in the development of an apparatus for transferring a sample from one vacuum system to another while the sample was held at UHV pressures. He demonstrated use of the apparatus by transferring a sample from Ottawa to Vienna, Austria, while maintaining a pressure of less than 10^{-10} torr.

Peter retired from NRC in 1986 and formed a consulting firm, National Vacuum Technologies Inc, in which he was active until his death. He was a coauthor with us of *The Physical Basis of Ultrahigh Vacuum* (Chapman & Hall, 1968), which was reprinted in 1993 as part of the American Vacuum Society Classic series.

Peter was very active in AVS: The Science and Technology Society. He was largely responsible for organizing the beginning of the surface science division and was its first chairman from 1968 to 1969. He was a member of the society's board of directors from 1979 to 1981. In 1990, he won its Albert Nerken Award. Also active in the Canadian Association of Physicists, Peter established the biennial Surface Canada conferences in 1979. In recognition of his efforts, the J. P. Hobson Prize was created in 1983 to honor the best student paper at the conferences.

Peter's lifestyle was vigorous and competitive. Some of his favorite recreational activities were tennis, jogging, fishing, skiing, curling, and hunting. Until the last two years of his life, Peter and his wife were regular participants in the AVS Run, an event held annually in conjunction with an AVS symposium.

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Daniel Kivelson

Daniel Kivelson, an emeritus professor of physical chemistry at UCLA, died of cancer in Los Angeles, California, on 23 January 2003. Throughout his career, he combined expertise in experimentation with fundamental theoretical analysis to make important advances in several fields of chemical physics. Those fields included microwave spectroscopy, electron spin resonance spectroscopy (ESR), nuclear magnetic resonance, low-energy electron-molecule scattering, dynamic light scattering, relaxation phenomena in liquids and viscoelastic fluids, and supercooled liquids and glasses.

Daniel was born in New York City on 11 July 1929. He was educated at Harvard University, where he received an AB in chemistry and physics (1949), an MS in physics (1950), and a PhD in chemical physics (1953). His doctoral research, with E. Bright Wilson, in molecular spectroscopy included development of the theory of internal rotation and centrifugal distortion applied to the mi-



Daniel Kivelson

crowave spectra of small molecules.

In 1955, he joined the chemistry faculty at UCLA, where he spent the remaining 48 years of his career. During that time, Daniel served as department chair (1975–78) and chair of the UCLA academic senate (1980–81).

In the 1960s, Daniel concentrated his research on ESR studies and used both theoretical and experimental approaches. One of his papers, a “citation classic” that was published in 1960 in the *Journal of Chemical Physics*, applies linear-response theory to develop a complete and systematic approach to understanding ESR linewidths in liquids. That paper was the beginning of his long fascination with liquid dynamics.

Daniel had moved into studies of liquids by the early 1970s. He concentrated on molecular rotations and determined the effect of molecular reorientation and relaxation dynamics on dielectric phenomena by probing them simultaneously with ESR and optical methods. Thirty years later, his contributions to depolarized light scattering from viscoelastic liquids, and specifically to the coupling of shear modes in those systems, are still regarded as the definitive work in the field.

In the late 1980s, Daniel began to focus on the special nature of supercooled liquids; that work led to his interest in the glass transition and the nature of the glassy state. In the 1990s, he developed a new physical picture for the glass transition: The liquid prefers a local structure but is prevented by geometric frustration from crystallizing via a critical phase transition into a periodic structure consistent with the local structure. Although it has proved difficult to tie his picture to a concretely defined order parameter for the

glass transition, the idea of an “avoided critical point” is consistent with much of the known phenomenology and has had a profound influence on the field. As he wrote in 1997 (*Journal of Physical Chemistry*), “I have never been as excited by my science as with this work because it represents an attempt to develop a novel, initial description of important, but still not well-understood phenomena.” He continued to pursue that research with energy and enthusiasm until shortly before his death.

Daniel was not committed only to research. His devotion to teaching was recognized by a university teaching award in 1969. He was constantly seeking new and better ways to present fundamental ideas to his students; every year, he thoroughly revised the detailed notes he distributed. Although he had many graduate students and postdocs, undergraduates played a significant role in his experimental research. After nominally retiring in 2000, Daniel remained active in research and continued to teach undergraduates.

In recognition of his remarkable contributions in research, teaching, and university service, Daniel received the UCLA College of Letters and Science Award in 1987. His scientific awards included the American Chemical Society's California Section Award in 1967 and the American Physical Society's Irving Langmuir Prize in Chemical Physics in 1999.

The Kivelson family has been described as a “distinguished academic dynasty.” Daniel's wife, Margaret, a professor at the Institute of Geophysics and Planetary Physics at UCLA, and son, Steven, a physics professor at UCLA, each collaborated with Daniel on a few papers. Daniel's daughter, Valerie, is an associate professor of history at the University of Michigan. One obsession of the family is Turkoman rugs; Daniel, together with his wife, was an avid collector of Turkoman rugs. The family lent pieces from their collection to various museums.

Daniel believed in a just society and was dedicated to the elevation of the civil rights, well-being, and human dignity of all people. He was deeply disturbed by many recent developments, both in the US and abroad. He set an example that has been a source of inspiration to many. His ambition was not to win prizes and attract attention (although he did), but to do beautiful science, to enjoy doing it with friends, and to instruct new generations of scientists.

For more than four decades, those of us fortunate to be Daniel's friends