George Hsing Kwei

George Hsing Kwei, known for his foundational research in chemical physics, particularly on molecular-collision dynamics and neutron diffraction, died on 10 June 2005 in San Francisco of a hemorrhagic stroke.

Born in China's Hunan province on 17 November 1938, George spent his early childhood in Switzerland; during World War II his father, General Kwei Yun-Ching, headed a diplomatic mission there. After the war, his family returned to China, but moved to Taiwan in 1949 when the Nationalist government fell. George came to the US at the age of 12, and entered Harvard University at 16. As an undergraduate, he did significant work in microwave spectroscopy with Robert Curl Jr in the laboratory of E. Bright Wilson Jr. George graduated with honors in chemistry and physics in 1959.

At the University of California, Berkeley, where he pursued his graduate degree, George was the first student to join one of us (Herschbach) in experiments using molecular beams to resolve chemical-reaction dynamics under single-collision conditions. George had a key role in early studies of reactions of alkali atoms with halogen compounds. That work was seminal to the development of molecular beam chemistry, now a major field. After receiving his PhD in 1967, George joined the chemistry faculty at the State University of New York, Stony Brook. There he conducted experiments and classical trajectory calculations dealing with long-lived collision intermediates and made a unique study of the reaction of hydrogen atoms with tritium molecules.

In 1974 George became a research scientist at Los Alamos National Laboratory. He conducted several experiments on collisional energy transfer, especially the exchange of electronic excitation, and on laser-induced photodissociation and ionization. He also elucidated the dynamics of the reaction of nitric oxide with ozone, an important reaction in stratospheric chemistry. Increasingly asked to take on administrative responsibilities at Los Alamos, he became deputy associate director for chemistry, Earth, and life sciences in 1982. In that position, he helped launch several new initiatives, including resonance ionization mass spectroscopy, synchrotron beam line instrumentation, and a molecular biology program that eventually contributed to the National Human Genome Project.

George returned to research in 1988. Remarkably, he undertook work

George Hsing Kwei

in a field wholly new to him—structural studies of materials by means of neutron and x-ray diffraction. Over the next 14 years, he published more than 100 papers, many on high-temperature superconductors and other mixed-valency solids, others demonstrating structural instabilities near phase transitions, ordering on nanometer length scales, and intercalation into fullerene interstices. An important aspect of much of his work was its focus on local structure. George advocated and demonstrated the advantages of evaluating pair-distribution functions from powder diffraction data. That method, ordinarily used for gases or liquids, reveals local structural variations and distortions from crystal symmetry and has proven particularly fruitful in analysis of metallic alloys, order–disorder transitions, superconductors, and proteins.

In 1994, George moved to Lawrence Livermore National Laboratory, but he continued to pursue projects at several neutron-source facilities in collaboration with researchers from institutions across the US and Japan. He took leave in 1997 to return to Los Alamos, where he spent two years as a special assistant in the director's office. He returned to Livermore in 2000, and was awarded the Edward Teller Fellowship in recognition of his scientific accomplishments. Beset by ill health, he retired in 2002. Although unable to complete the book on science policy he intended to write as his Teller Fellowship project, he much enjoyed writing letters on political issues to newspapers and seeing a number of them published.

George lived his life with passion and pleasure. To his scientific work, he brought joyful enthusiasm, intellectual acuity, and virtuoso craftsmanship. His willingness to ask "dumb" questions enabled him to bring fresh perspectives to any new endeavor. In those who were privileged to work with him, he fostered a congenial team spirit. He was especially sensitive to the professional development of his postdocs and younger colleagues, and he took great pride in their later achievements. George's interactions were enhanced by his warm good humor, ample supply of apt stories, high standards, and astute judgment. He was generous in acknowledging the contributions of his colleagues.

Intensely devoted to his family and many friends, George shared with them his love of music, art, fine wine, and food. Even in his graduate-student days at Berkeley, he led his fellow researchers on many trips to savor restaurants in San Francisco; he always knew, week by week, where the best chefs would be. At Los Alamos, his hobby activities focused in succession on racing bicycles, collecting fine violins and bows, and constructing an elegant harpsichord. He was directly responsible for Yo-Yo Ma's first New Mexico appearance, at a performance for the Los Alamos Concert Association. Over the years, he assembled more and more splendid high-fidelity sound equipment. Ultimately, his gear included a pair of big bass horns that are more than a meter in diameter. He delighted in seating visitors between those massive horns, adjusting ears by a few millimeters to achieve optimal results.

Thoughts of him always bring forth a vision of his smile. Earnestly charming, often playful, his smile radiated happiness in sharing with others his wholehearted zest in life.

Dudley R. Herschbach
Harvard University
Cambridge, Massachusetts
James L. Kinsey
Rice University
Houston, Texas

Anatoly Ivanovich Larkin

Anatoly Ivanovich Larkin—"Tolya" to his friends and colleagues—died of heart failure on 4 August 2005 in Aspen, Colorado. He was a universally recognized leader in condensed matter theory and a celebrated teacher of several generations of theorists. Until the very end, he was remarkably productive and remained a desirable collaborator for many

younger colleagues. His recent publications have the same depth and originality as the first paper he published 47 years ago.

Born on 14 October 1932 in the small town of Kolomna in central Russia, Larkin went to Moscow to study physics at the Institute for Physical Engineering. He was taught by Igor Tamm, Mikhail Leontovich, Isaac Pomeranchuk, and Arkadii Migdal, and after two years of research under Andrei Sakharov's guidance, he joined Migdal's group at the Kurchatov Institute. In 1966 he moved to the newly organized L. D. Landau Institute for Theoretical Physics in Chernogolovka, near Moscow, which became his home for the next 25 years. In 1995 he joined the University of Minnesota as a professor of theoretical physics, but he returned to Chernogolovka every summer.

Larkin's research career began at the time when young theorists were still expected to study all branches of theoretical physics. In his first papers, Larkin applied the newly developed Matsubara diagrammatics to the calculation of the thermodynamics of plasmas and the energy losses of fast particles passing through them. In a series of joint publications with Migdal, Larkin used the Landau Fermi-liquid theory to describe the properties of atomic nuclei.

Following the development of the Bardeen-Cooper-Schrieffer (BCS) theory of superconductivity in 1957, Larkin began his studies of that subject, which was to become his lifelong passion. Although he made a significant contribution to particle and nuclear physics and to the theories of phase transitions, magnetism, and disorder, it was superconductivity to which he kept returning and in which his impact was truly outstanding. Among his greatest achievements are the prediction of the fluctuation-driven enhancement of conductivity above the critical temperature T_c, the theory of the Josephson effect in superconductor–normal metal–superconductor junctions and in superconducting point contacts, the prediction of pairing with finite momentum, a semiclassical theory of nonequilibrium phenomena including nonlinear flux flow, the theory of collective creep, and thermally activated flux dynamics in the high-T_c materials.


JOHN LINN

Anatoly Ivanovich Larkin

In 1961 Valentin Vaks and Larkin suggested that the properties of soft pions could be explained by a BCS-like spontaneous breaking of chiral symmetry. That concept proved to be an important step toward the creation of the standard model of particle physics. In a 1969 paper, Larkin solved the problem of the singularity of thermodynamic functions at the type II phase transition in uniaxial ferroelectrics. It was the first successful application of the renormalization group to condensed matter theory. The paper was significant in the development of the theory of critical phenomena.

Larkin also made a great impact on the physics of one-dimensional metals. His calculations of the Green's functions of fermions and the correlation functions of density and spin density laid the foundations of the modern theory of the field. His further contributions included applying the theory of collective pinning to the dynamics of charge density waves, and developing the theory of the thermal activation of Frölich's conductivity. In the theory of disordered conductors, Larkin and his collaborators initiated several new research directions: weak localization, mesoscopics, and quantum chaos.

Larkin was also known as a great teacher, one who could work with students of different personalities. Lev Aslamazov, Vladimir Fileov, Lev Ioffe, Vadim Geshkenbein, Victor Galitski, Chushun Tian, and the four of us all did PhDs (or equivalent works) under his supervision. Yuri Dreyzin, Konstantin Matveev, and Valery Rupasov were his students as undergraduates. Working with Larkin created a unique feeling of joy, which attracted many different collaborators to him.

Larkin received many formal signs of recognition: He was elected a full member of the Russian Academy of Sciences (1991), and was a recipient of numerous prizes, including the Fritz London Memorial Award (1990), the Hewlett-Packard Europhysics Prize (1993), and the Lars Onsager Prize (2002). He was greatly respected by his colleagues, who admired him for his talent, modesty, and tireless work.

His death in the Colorado mountains was entirely unexpected. He was still hard at work on several ambitious projects. The coming years will doubtless see the publication of new papers under the familiar name of A. I. Larkin.

Konstantin B. Efetov
Ruhr University
Bochum, Germany
David E. Khmelnitskii
Cavendish Laboratory
Cambridge, UK
Yuri N. Ovchinnikov
L. D. Landau Institute
for Theoretical Physics
Moscow
Paul B. Wiegmann
University of Chicago
Chicago, Illinois ■