



JOHN ELLIOTT NAFE

tritium and deuterium were landmark contributions to the field of nuclear physics. Jack got his doctoral degree in physics in 1948.

Jack went on to the University of Minnesota as an assistant professor in the physics department, but was called back to New York in 1951 to be director of research at Columbia's Hudson Laboratories. Jack and his colleagues focused on using the acoustic properties of the oceans, determined by temperature, salinity and pressure, to produce a listening system that could detect submerged submarines at long distances.

At heart, Jack was a teacher, and he quickly formed an association with the Lamont Geological Observatory, a research arm of Columbia's geology department which was later renamed the Lamont-Doherty Earth Observatory. He became an adjunct professor of geology at Columbia in 1955 and a tenured full professor in 1958. At that time, Lamont had graduate students in geophysics, geochemistry and oceanography. He taught most of the fundamental courses in geophysics in the department and had a habit of leaving out a minus sign as he was writing on the blackboard to see if the students would catch the error. He was eager to share his physics knowledge and would spend considerable time with students to ensure that they understood fundamental principles. When a student came into his office seeking a formula to solve a problem, Jack would take him back to Newton's laws and derive it.

Jack's interests were very broad. He had a keen interest but little formal training in geology, and he devoted considerable time when traveling to examining the fossils in local rocks. His research interests were mainly associated with acoustic wave propaga-

tion and included interpretation of dispersion of earthquake surface waves and the use of seismic refraction measurements to determine the structure of the oceanic areas. To perform these studies, Jack sometimes traveled on research ships of other institutions and other countries. During one of those cruises, he participated in an experiment that demonstrated that explosive sounds of modest size in the ocean could be detected halfway around the world, a demonstration that led to the current attempt to measure changes in the mean temperature of the oceans through long-range sound propagation. His interest in the acoustic properties of Earth materials led to the development of a curve relating seismic velocities to density, which provided much-needed constraints on gravity models of Earth's structure and is still in use.

Jack served as chairman of Columbia's geology department from 1962 to 1965. Although his career was slowed by a severe stroke in 1976, he remained active in the department until his retirement in 1980, when he moved to Vancouver to be close to family members.

CHARLES L. DRAKE

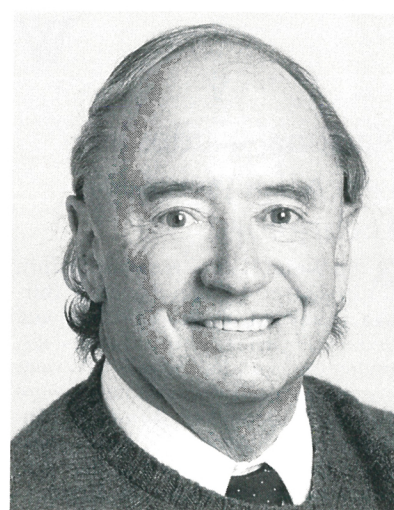
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John Adair Barker

John Adair Barker, a distinguished Australian-American theoretical chemical physicist, died on 27 October 1995 in Los Gatos, California, following a brief illness. At the time of his death, he was an emeritus member of the research staff of the IBM Almaden Research Center in San Jose.

John was born on 25 March 1925 in Corrigin, Western Australia. He graduated from the University of Melbourne with bachelor's degrees in physics (1944) and mathematics (1945). In 1949, John joined the research staff of the Division of Physical Chemistry of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Melbourne, and remained there for 19 years, rising to become a chief research officer. He worked first on the thermodynamics and statistical mechanics of solutions, initially in connection with measurements of liquid-vapor equilibria. This research on solutions led to his developing a general interest in liquids. He used lattice theories in his early work in liquids, and these investigations formed the basis of a thesis that he presented to the University of Melbourne for his DSc in 1958.

In 1968, John became a professor of applied mathematics and physics at the University of Waterloo in Ontario,



JOHN ADAIR BARKER

Canada. He joined IBM in 1969. Owing in large part to John's research, it became clear that lattice theories did not provide the basis for a satisfactory theory of liquids. In 1966 and 1967, John and Douglas Henderson developed a perturbation approach that was the first successful theory of the liquid state; the theory emphasized the similarities between liquids and gases. The key to its success was the use of a hard-sphere gas, with a temperature-dependent diameter, as the reference system. This method of relating the thermodynamics of a fluid to those of a hard-sphere fluid and of calculating the effective diameter of the molecules in the reference system is still used widely.

At about the same time, John developed an interest in intermolecular forces. That was the dominant theme of his work during the last half of his career. He used all available experimental data and theoretical results to determine the atomic interactions and to calculate the properties of the gaseous and condensed phases. He was able to reconcile differences between viscosity and inelastic neutron-scattering results, and he determined the pair potential for argon, which, together with the Axilrod-Teller-Muto triple dipole interaction, reproduced the known properties of gaseous, liquid and solid argon.

The last several years of John's career were devoted to the determination of an accurate potential for the interaction of adsorbates with single crystal surfaces. He was able to invert experimental data to obtain reliable and accurate force fields describing such interactions and to use these force fields to extract a definitive picture of such dynamical events as adsorption, gas-surface scattering and thermal desorption. In so doing, he contributed to the development of more rigorous theoretical foundations

for the field of surface science.

John had a good life, not only because he had much success as a scientist and enjoyed life, but also because he was a good man. Many scientists do not suffer fools gladly, but John did. He was unfailingly polite and generously took the time to sit down with others and help them with their work. His kindness, enthusiasm and intellectual honesty were an example to all of us. He is missed, and will continue to be.

DOUGLAS HENDERSON

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MICHAEL KLEIN

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Richard Nelson Thomas

Richard Nelson Thomas, who had a pervasive, beneficent and enduring influence on stellar-atmosphere theory, died in Boulder, Colorado, on 8 April 1996 at the age of 75.

Dick Thomas, born in Omaha, Nebraska, received his bachelor's degree in astronomy from Harvard University in 1942. During World War II, he served as a ballistician at the US Army's Aberdeen Proving Ground. He returned to Harvard after the war for his doctoral degree in astronomy, which he received in 1948. He then became an associate professor of astronomy at the University of Utah, leaving there in 1953 to join the Harvard faculty as a visiting lecturer.

Thomas moved to Boulder in 1957 and for five years served as a consultant in astrophysics to the laboratory director of the National Bureau of Standards. He had long advocated far more comprehensive and accurate measurements of collisional and radiative atomic cross sections, which were needed to understand stellar spectra. In that cause, he joined forces with Lewis Branscomb, then head of the atomic physics division at NBS in Gaithersburg, Maryland, and together they helped found, in 1962, the Joint Institute for Laboratory Astrophysics in Boulder. Among the many legacies Thomas left to JILA was his fierce defense of the visiting fellowship program when it was threatened with termination in the early years.

Thomas resigned from JILA in 1973 and moved to Paris to join his long-time colleague, Jean-Claude Pecker, at both the Collège de France and the University of Paris. There he turned his attention to emission-line B stars, whose extended atmospheres offered a challenge to new theoretical work.

Through the mid-1980s, Thomas—with Pecker and Stuart Jordan—organized a monumental series of monographs by experts on all aspects of nonthermal phenomena in stellar atmospheres. From 1977 to 1986, Thomas worked at the National Center for Scientific Research, also in Paris. In 1986, he returned to Boulder, where he consulted for Radiophysics, Inc.

Thomas in his later years became convinced that mass flows from stars originate deep in their envelopes, not in their extended atmospheres. He pursued this controversial hypothesis single-mindedly until felled by a stroke several years ago.

Recognizing the general inadequacy of available data on the Sun's chromosphere, Thomas persuaded Walter Roberts and John Evans to field an expedition to observe the 1953 Khar-toum total eclipse. The analysis of the resulting spectra occupied Thomas, Grant Athay and a host of other students for a decade afterward.

Thomas is best known for his central role in creating a novel theory of spectral line formation in opaque stellar atmospheres. He realized very early that local thermodynamic equilibrium (LTE) cannot strictly apply in the outer regions of a star where many of the strong lines originate. He established quite conclusively that most ionization and excitation processes in such regions are governed, in a steady state, by the local collisional processes and the nonlocal radiation field. He was a key member of the small group that developed the formalism required to calculate line spectra and that applied it to studies of the strong Fraunhofer lines. From its simple beginnings with hand calculators, the new theory blossomed in the era of fast computers to become the orthodoxy that is known today by the name of Non-LTE.

Thomas had no patience for sloppy thinking. His career was marked by extraordinarily high standards for research, a passion for understanding and an unrelenting commitment to his science. Although he offended many by his self-assured criticism, he nevertheless attracted many of the best minds in the field to his point of view. He was tireless as a researcher, with few other interests beyond spectator football and large dogs. As a person, he was easily approached and unsparing of his time. He will be missed by his many colleagues for more than his gadfly ability to stimulate thought.

JOHN T. JEFFERIES

JACK B. ZIRKER

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Lyman G. Parratt

Lyman G. Parratt, a noted researcher in x-ray physics, a group leader in the Manhattan Project and longtime member of Cornell University's physics department, died on 29 June 1995 in Redmond, Oregon.

Parratt was born on 17 May 1908 in Salt Lake City. He earned an AB in physics from the University of Utah in 1929 and three years later was awarded a PhD by the University of Chicago for his work in x rays. In 1933, after a postdoctoral year at Chicago, he went to Cornell University, thus beginning a 60-year association with Cornell's physics department, from which he officially retired in 1973.

In 1941 the US Navy requested that Parratt take leave from Cornell to work at the Naval Ordnance Laboratory in Washington, DC, on submarine detection and the demagnetization of surface ships. Two years later, he was called to Los Alamos and spent the rest of the war years as a group leader in the Manhattan Project. He returned to Cornell in 1946 and took part with four others in the physics department's reorganization, which soon put Cornell at the forefront of the nation's physics departments. The reorganization established the Laboratory of Nuclear Studies as a major component of the department. A decade later, in 1959, Parratt was chosen as the department head at the time of a second reorganization. This one resulted in the establishment of the Laboratory of Atomic and Solid State Physics. He served as head for two five-year terms.

Parratt's abiding interests related to x rays. Early on, he was particularly interested in "satellite" lines accompanying K alpha radiation and multiply ionized inner shells. By making his high resolution wavelength and intensity x-ray measurements on many of the elements, he provided support for the Wentzel-Dryvesteyn theory. This high-resolution work led him to consider the effects of solid-state binding on x-ray spectra, both in emission and absorption, which involved relaxation of outer electrons around an inner electron vacancy. He also studied thin films and solid surfaces by means of total x-ray reflection. At the time, his instrumentation and measurements were without peer.

Parratt's work elucidated the states of multiply excited atoms and greatly extended our understanding of atomic structure. With his student Charles Hempstead, he also studied anomalous dispersion in x-ray scattering and absorption. Their determination of anomalous scattering coefficients, in use to this day, made a significant