Walter Lyons Brown FREE

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Walter Lyons Brown

Walter Lyons Brown passed away on 29 October 2017 in Basking Ridge, New Jersey. He was a superb experimental physicist with deep insights and had an expansive character that cultivated new science and young scientists. He exercised those qualities superbly at Bell Labs, where he spent most of his career.

Walter was born on 11 October 1924 in Charlottesville, Virginia. His father was a physics professor at the University of Virginia, and Walter was "in the lab" at the age of 10. After a stint in the US Navy, Walter went to Duke University, from which he graduated in 1945 with a BS in physics. He attended graduate school at Harvard University and earned a master's degree in 1947 and a PhD in 1951 under the supervision of future Nobelist Edward Purcell. In his thesis, Walter observed the experimental binding energy of the deuteron; he calibrated his measurement using the high-resolution electron-energy capabilities of a magnetic spectrometer—an instrument that, characteristically, he had machined.

A visit to Bell Labs, with its stimulating atmosphere and high quality, lured Walter. On 1 December 1950 he embarked on what resulted in a 51-year career there. Following retirement, he accepted a position as an adjunct professor at Lehigh University, mentoring students in materials research.

After first working in Bell's contact-physics department, Walter moved to the transistor-physics department and helped produce the newly invented device. Daily interactions with William Shockley, Walter Brattain, John Bardeen, and other scientific luminaries were exciting and stimulating. Walter believed that his observation of the field effect on the surface conductance in germanium was his most important scientific contribution in those early years. That nascent semiconductor science led to exploration of the effects of energetic particle bombardment, which would strongly influence the remainder of his career.

Walter Lyons Brown

In 1959 Walter was promoted to department head of semiconductor physics. In 1965 he became head of a new department, which he chose to call "radiation physics" because, he dryly noted, with that title you could explore any field of physics. As its leader, Walter not only showcased his strength as a physicist but also created new research areas, cultivated young scientists, and reinforced the spirit that made Bell Labs so distinctive—strong collaboration, excellent science, and a hotbed of ideas and invention.

Walter's experience with semiconductors and particle beams helped stimulate new directions, some far from the Bell Labs mainstream. The characteristic Brown–Bell philosophy was that if it was exciting science, "we" should be involved. For Walter, that took the form of establishing a nuclear-physics effort. In the 1960s nuclear physicists were at the frontiers of electronics, radiation detection, and the online use of computers—all areas close to Bell Labs' interests. To enable the nuclear enterprise, Walter engineered one of the earliest and most substantial university–industry collaborations, a state-of-the-art tandem accelerator laboratory with Rutgers University.

In 1960 Bell entered the communications space race when they began to develop a broadband satellite communications system, *Telstar*. Determining how to mitigate the effect of the Van Allen radiation belts on solid-state electronics was a perfect challenge for Walter: It made abundant use of his background and led him to new areas of investigation and management. Walter and his team developed unique packages of nuclear-physics-type radiation detectors to measure particle fluxes in space. The measurements were instrumental to making *Telstar* a success. In the harried atmosphere of Bell's space-science endeavor, Walter was crucial—commuting among labs and locations, testing and designing, managing large groups, and even being the "midnight phantom foamer" to minimize launch vibration effects.

Walter continued his interest in charged particles and semiconductors. Bell's space-related research evolved to programs in astrophysics, geoscience, and plasma physics. Studies of particle–solid interactions led to Bell Labs' leadership in ion implantation, a process that has contributed importantly to the silicon revolution. Walter and his colleagues' studies of particle–ice interactions led to the concept of the electronic-sputtering mechanism of insulators. Walter's contributions were personal—he was in the laboratory at all hours—and he created a rich science and applications environment that expanded the horizons of those who interacted with him.

Walter was much admired for his contributions to science and technology. His many honors included the 1984 Arthur Von Hippel Award from the Materials Research Society.

Throughout his career, Walter was first and foremost devoted to his family and his faith. He taught Sunday school for more than 40 years, and until recently he constructed houses with Habitat for Humanity.

His many colleagues, including the four of us who were members of his Bell Labs department, are thankful to

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have been a part of his life and to have shared in his excitement for science and engineering.

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Rufus Haynes Ritchie

Rufus Haynes Ritchie, best known for the discovery of the surface plasmon, died peacefully on 29 July 2017 in Gilbert, Arizona. He was a corporate fellow at Oak Ridge National Laboratory (ORNL) and a Ford Foundation Professor of Physics at the University of Tennessee, Knoxville. Called Ritchie by many of his friends and even his wife, Dorothy, he was the very definition of a gentleman and a scholar.

Born in the coal-mining camp of Blue Diamond, Kentucky, on 24 September 1924, Ritchie originally studied electrical engineering and earned a bachelor's degree from the University of Kentucky in 1947. During World War II, he served in the US Army Air Corps and attended military scientific education programs at such schools as Harvard and Yale Universities and MIT. In 1949 he joined the health-physics division at ORNL, where he spent his entire career, except for sabbaticals at Cambridge University's Cavendish Laboratory and in Denmark. In 1959 he received a PhD in physics, under the supervision of Richard Present, from the University of Tennessee, Knoxville. Several years later he took a joint faculty appointment there in the physics and astronomy department.

The health-physics division at ORNL was created to develop a body of staff members specifically trained in radiation damage to both materials and living tissues. Early on, close collaborations between experimentalists and theorists were strongly encouraged, and they became a hallmark of Ritchie's work.

In the early 1950s, while analyzing experimental data with Robert Birkhoff, Ritchie became interested in the way energy losses are distributed when a fast electron passes through a thin metal foil. In working out the spectrum to describe how the metal should respond, he discovered the surface-localized collective electronic oscillation now known as the surface plasmon or surface plasmon polariton.

The discovery met fierce resistance from those who doubted that the surface plasmon could exist, and initially Ritchie was hesitant to move forward with his work. However, encouraged by his ORNL colleagues and mentors, such as Birkhoff, Sam Hurst, and Jacob Neufeld, and by David Pines, he published his prediction in a 1957 paper in *Physical Review*. Three years later a series of electron-scattering experiments at the National Bureau of Standards (now NIST) confirmed surface-plasmon losses.

The full effect of Ritchie's discovery became clear only years later with the advent of nanotechnology in the late 1990s. The surface plasmon polariton can now be used to confine and manipulate light at the nanoscale, far below the diffraction limit of light. It provides large field enhancements for biosensors, surface-enhanced Raman scattering, diode lasers, and other physical effects. Ritchie's 1957 paper opened up the new fields of nanoplasmonics and nanophotonics to various uses and has inspired many practical applications in such areas as optoelectronics, photovoltaics, solar energy conversion, and biomedicine.

Ritchie also is regarded as one of the founders of modern radiation dosimetry.

OAK RIDGE NATIONAL LABORATORY

Rufus Haynes Ritchie

For example, he devised quantitative schemes in fast neutron dosimetry by the proportional counter and threshold detector methods. That work was essential for creating the Ichiban program to determine radiation exposure of the survivors of Hiroshima and Nagasaki.

Ritchie was a world leader on the topic of charged particles interacting with solids and surfaces. He developed a dielectric formalism for the response of a quantum plasma and studied electronic wakes, which are the spatial and temporal distributions of electronic fluctuations around fast ions moving in solids or near surfaces. He developed the first nonperturbative theory of interaction of slow ions with matter, a subject highly relevant to the study and application of ion penetration in materials.

Among his many honors were the 1984 Jesse W. Beams Award from the Southeastern Section of the American Physical Society.

An outstanding scientist, Ritchie combined great physical intuition with stellar technical competence and mathematical ability. He could provide in a day or two a model and an elaborate calculation of an idea that had just been discussed. He was able to adapt and improve it almost instantaneously after new aspects were discovered. He was universally respected and admired as a great theoretical physicist.

Ritchie combined, to an unusual degree, a profound knowledge of the fundamentals, a deep sense of the history of scientific culture, and a sympathetic and enthusiastic outlook toward new ideas. The creative nature of his intellect and his accessibility made him not only a superb condensed-matter physicist but also an excellent communicator, teacher, and mentor both in and out of the classroom. More importantly, he was a warm and caring human being, full of love and concern for his family, friends, and coworkers. He will be remembered for his finesse, gentle and generous personality, and almost infinite kindness. His presence is sorely missed.

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