

Dick's comprehensive grasp of the interface between lofty theory and reality as revealed by painstaking metrology.

Dick's early years at NIST were devoted to spectroscopy of molecules and development of high-resolution x-ray spectrometers and powerful x-ray sources. In 1968, he became leader of a precision metrology and x-ray spectroscopy research group, a position he held for 33 years until his retirement at the end of April 2001. Throughout his entire career, Dick did not permit administrative duties to curtail his active involvement in laboratory experiments.

His early metrology efforts were directed toward the development of x-ray interferometry and the iodine-stabilized laser. In 1973, Dick produced the first combined x-ray and optical interferometer that was able to demonstrate the feasibility of accurate measurements of the lattice periods of silicon single crystals tied to the International System of Units (SI) definition of the meter. He led a multidisciplinary effort at NIST to combine the improved lattice-spacing measurements with new density and isotopic-abundance measurements to determine a value for the Avogadro constant with a defensible error budget near 10^{-6} . The iodine-stabilized laser research led by Dick included characterization of this potential new length standard and comparisons with infrared radiation and the krypton length standard. This effort, along with contributions from other national measurement laboratories, led to the effective replacement of the krypton standard and the ultimate elimination of a separate length standard through a redefinition of the meter in 1983 based on the fixed speed of light.

In 1977, Dick became a senior NIST research fellow and led a major effort to use the accurately measured crystals to measure x-ray and gamma-ray wavelengths on a scale consistent with the SI definition of the meter. These measurements unified the optical to gamma-ray wavelength scales and eliminated the need for the x- and Å*-units that were commonly used. The improved standards also had the effect of resolving discrepancies between theory and experiment for high-Z muonic atoms and establishing an improved value for the kaon mass.

Dick was a pioneer in the use of intense synchrotron radiation for atomic physics studies. He and his colleagues first (in 1978) used the Stanford Synchrotron Radiation Project.



RICHARD DAY DESLATTES

They then established an innovative beamline, X24A, at the Brookhaven National Synchrotron Light Source, where new discoveries such as x-ray selection of oriented molecules and polarization spectroscopy occurred.

During the period 1980 to 1981, Dick took a leave of absence to serve as director of NSF's physics division. Dick and his colleagues initiated a long-term study of the systematics of neutral-atom x-ray spectra that included comparison with state-of-the-art theory. This effort recently produced a new, all-Z, x-ray wavelength database.

In 1983, Dick was honored by the Alexander von Humboldt Foundation in Bonn, Germany, with a Senior US Scientist Award. This award permitted him to participate in research collaborations from 1983 to 1984 in Germany at the University of Heidelberg and the GSI heavy-ion research center in Darmstadt, and at the Institut Laue-Langevin (ILL) in Grenoble, France. In the collaborations at Heidelberg and the GSI, Dick applied high-resolution, crystal-diffraction spectroscopy to studies of the spectra of highly stripped ions produced by large accelerators. These measurements provided stringent tests of the theory of quantum electrodynamics. The collaboration at the ILL developed into a world-class gamma-ray spectroscopy facility, which is still active today and emphasizes nuclear and solid-state physics as well as precision measurements. These measurements have recently included an accurate determination of the deuteron binding energy that has led to an improved value for the neutron mass and extension of the SI-based gamma-ray wavelength measurements into the 6-MeV region.

In 1990, Dick received the SUN-AMCO Medal, awarded by the International Union of Pure and Applied Physics, for his program to measure the Avogadro constant, his measurement of x- and gamma-ray wavelengths, and his development of ultrahigh-resolution gamma-ray spectroscopy.

Dick gave generously of his time to the scientific community, organizing international symposia and serving on committees, panels, and governing bodies. From 1985 to 1986, he was chair of what is now the APS division of atomic, molecular, and optical physics. He served on the editorial board of *Physical Review A* from 1999 to his death.

Dick was ready to listen to colleagues' problems and willing to go beyond the call of duty by helping to apply his precision optical and x-ray measurement techniques. He was highly esteemed by a large circle of collaborators. These interactions flourished as a result of Dick's willingness to share responsibility and his appreciation for the strengths of the contributing scientists, at NIST and worldwide. On the occasion of his retirement in April 2001, Dick noted that it had been his pleasure actually to have participated in an experiment or written a paper with almost everyone in the large gathering assembled to honor him. Those of us who had the privilege of collaborating with Dick know that the pleasure was ours.

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William Wilson Mullins

William Wilson Mullins, a physicist and materials scientist best known for his work on morphological changes of surfaces, interfaces, and grain boundaries, died on 22 April 2001 in Pittsburgh, Pennsylvania, after a yearlong battle with cancer.

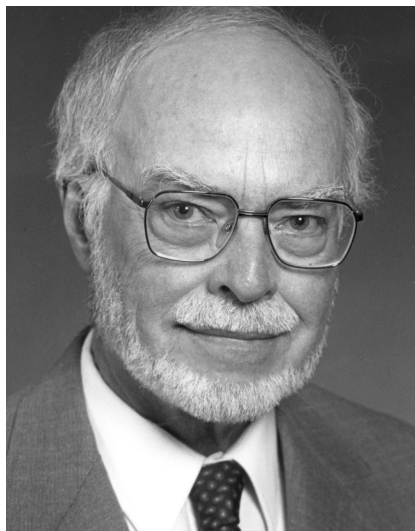
Bill was born on 5 March 1927, in Boonville, Indiana, and grew up in Chicago. He earned the degrees of PhB (1949), MS (1951), and PhD (1955), all in physics, from the University of Chicago. His doctoral work was supervised by Cyril Smith, founder and first director of the university's Institute for the Study of Metals. Bill's doctoral work involved

the experimental measurement of grain-boundary energies, which later led to his first scientific publication, "Magnetically Induced Grain Boundary Motion in Bismuth," in *Acta Metallurgica* (1956).

In 1955, he was hired by Clarence Zener as a research scientist at the Westinghouse Research Laboratories in Pittsburgh, where he worked until 1960 in such areas as theory and topology of grain-boundary motion; thermal grooving (theory and experiments in copper in collaboration with Paul Shewmon), surface melting; and scratch decay on surfaces. His seminal papers during this period led to a much more quantitative approach to the dynamics of morphological changes of surfaces and interfaces. He was particularly proud of his generalization to curved interfaces of John von Neumann's original $n - 6$ rule for growth of bubbles having flat interfaces in a two-dimensional soap froth. For arbitrary shapes, Bill showed that the time rate of change of area of a grain is proportional to $n - 6$, where n is its number of sides, independent of shape, provided that the driving force is a lowering of isotropic interfacial free energy and that all triple junctions make local equilibrium angles of $2\pi/6$.

While at Westinghouse Research Laboratories, Bill met one of us (Sekerka), who was fresh out of high school and had been hired as a technician, assigned to work for Bill Mullins and for Bill Tiller. This was the beginning of Sekerka's education as a materials scientist and his discovery that Bill was a compulsive and extremely talented teacher. A scientist's scientist, Bill had the ability to translate very complex ideas into new areas of understanding. He was careful and patient, especially in explaining concepts to people who lacked his own formal training in physics and mathematics. His four sons frequently remarked that they seldom got through dinner without a science lesson.

It is therefore not surprising that Bill soon opted for a career in academia. In 1960, he joined Carnegie Institute of Technology as an associate professor of metallurgical engineering. He headed the metallurgical engineering department from 1963 to 1966. From 1966 to 1970, he served as the dean of the college of engineering and science. At that time, he put in place procedures to promote excellence in scholarship and had the foresight to start a department of biological sciences. He also helped to guide the merger with the Mellon Institute, which led to the formation of Carnegie



WILLIAM WILSON MULLINS

Mellon University and the division of the college of engineering and science into the Carnegie Institute of Technology and the Mellon College of Science. Bill subsequently gave up academic administration, both to return to his love of teaching and so that his wife could complete her doctoral studies and embark on her career as a professor of education. Bill was appointed university professor of applied science in 1985.

In his research subsequent to 1960, Bill developed several new themes. He collaborated with Sekerka during the summers of Sekerka's graduate education to develop a theory of morphological stability during precipitation or solidification. This theory led to a quantitative foundation for cellular and dendritic growth. Bill also took an atomistic approach to phenomena such as crystal faceting and kinetics of crystal growth, including step interactions on vicinal surfaces.

In the 1970s, he developed a number of theories based on statistics, including diffusion with stochastic jump times, particle flow under gravity, and size distribution of impact craters. Much of this work was stimulated by his acute observations of natural phenomena; for example, a paper on contrast thresholds of random patterns resulted from his curiosity about the flickering patterns he saw while looking into a swimming pool.

Somewhat more exotic was Bill's application of Newton's laws to revolutionize an annual competition (for the amusement of students) called the faculty egg toss. The rules were very simple: Throw a raw egg as far as possible and catch it unbroken. One of us (Paxton) learned to throw (grip the end with the smaller radius) and Bill

learned to catch (avoid too much rotational momentum, which is much harder to decelerate than translational momentum), resulting in throws on the order of 100 yards and winning tosses for several years.

Bill's scientific work continued after his retirement in 1992, even through the last week before his death. Topics included variational principles for conductance in heterogeneous bodies, thermodynamics of crystalline solids, statistical self-similarity in grain growth and coarsening, and, most recently, energy barriers for shape changes of crystals with facets and nonequilibrium morphologies.

In 1963, Bill won the Mathewson Gold Medal of the American Institute of Mining, Metallurgical and Petroleum Engineers. In 1984, he was elected to the National Academy of Sciences. In 1995, he received the Materials Research Society's highest accolade: the Von Hippel Award.

In addition to his scientific work, Bill was an active supporter of social causes, including environmental issues and world peace. A conspicuous contribution to the George McGovern presidential campaign earned Bill a place on Richard Nixon's political enemies list—an achievement of which Bill was proud.

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William Thomas 'Tom' Pinkston

William Thomas "Tom" Pinkston, a theoretical physicist of distinction and an emeritus professor of physics at Vanderbilt University, died on 10 May 2001, at his home in Nashville, Tennessee, after a lengthy battle with cancer.

Tom was born on 19 January 1931 in Albany, Georgia. He matriculated at the Catholic University of America in Washington, DC, where he received BS (1952), MS (1955), and PhD (1957) degrees, all in physics. The topic of Tom's dissertation, supervised by James Brennan, was the structure of lithium-6 based on the nuclear shell model.

Following a term as an instructor at Princeton University from 1957 to 1959, Tom accepted an assistant professorship in physics at Vanderbilt, where he remained until his retirement in 1996. He taught physics courses at all levels, ranging from graduate courses in quantum