Statement of Ownership, Management and Circulation

(Act of 12 August 1970; Section 3685, Title 39, USC)

1. *Title of publication:* PHYSICS TODAY
2. *Publication no.:* 0031-9228
3. *Date of Filing:* 1 October 2005
4. *Frequency of issue:* Monthly
5. *No. of issues published annually:* 12
6. *Annual subscription price:* $345.00
7. *Location of known office of publication:* 2 Huntington Quadrangle, Melville, NY 11747-4502
8. *Location of the headquarters or general business offices of the publisher:* One Physics Ellipse, College Park, MD 20740-3843
9. *Names and addresses of publisher, editor and managing editor:*

   Publisher: Randolph A. Nanna, American Institute of Physics, One Physics Ellipse, College Park, MD 20740-3843

   Editor: Stephen G. Benka, American Institute of Physics, One Physics Ellipse, College Park, MD 20740-3843

   Managing Editor: None
10. *Owner (if owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual, must be given. If the publication is published by a nonprofit organization, its name and address must be stated.):* American Institute of Physics, One Physics Ellipse, College Park, MD 20740-3843
11. *Known bondholders, mortgagees and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages or other securities:* None
12. *The purpose, function and nonprofit status of this organization and the exempt status for Federal income tax purposes:* Has not changed during the preceding 12 months
13. *Publication name:* PHYSICS TODAY
14. *Issue date for circulation data below:* August
15. *Extent and nature of circulation:*

   A. *Total number of copies (net press run)*
   Average* 128 316 August** 125 852

   B. *Paid and/or requested subscriptions*
   1,2. *Paid or requested mail subscriptions*
   Average* 121 702 August** 118 699
   3,4. *Sales through dealers and carriers, street vendors and counter sales; other classes mailed*
   Average* none August** none

   C. *Total paid and/or requested circulation (sum of B1–B4)*
   Average* 121 702 August** 118 699

   D. *Free distribution (samples, complimentary and other free)*
   Average* none August** none

   E. *Free distribution outside the mail (carriers or other means)*
   Average* 4 289 August** 4 277

   F. *Total free distribution (sum of D and E)*
   Average* 4 289 August** 4 277

   G. *Total distribution (sum of C and F)*
   Average* 125 991 August** 122 976

   H. *Copies not distributed (office use, leftovers and spoiled)*
   Average* 2 325 August** 2 876

   I. *Total (sum of G and H—should equal net press run shown in A)*
   Average* 128 316 August** 125 852

   Percent paid and/or requested circulation (C/G×100)
   Average* 96.60% August** 96.52%

* *Average number of copies of each issue during preceding 12 months*

** *Actual number of copies of single issue published nearest to filing date.*

I certify that the statements made by me above are correct and complete.

Randolph A. Nanna, Publisher

studies of the dose distribution of radiation absorbed from radioactive materials (primarily radium and fission products) administered to laboratory animals. From 1947 to 1954, Katherine was an associate biochemist at Argonne National Laboratory (ANL) in Lemont, Illinois, and a chemist at the U of C.

After her fifth child was born in 1952, Katherine found the commute to ANL burdensome, and in 1954 she joined the research team of surgeon Paul V. Harper at the Argonne Cancer Research Hospital on the U of C campus. Part of the Atoms for Peace program of the US Atomic Energy Commission, ACRH opened in 1953 with the mission of exploring uses of radioactive materials and radiation beams in the diagnosis and treatment of cancer. Katherine's broad background in the sciences enabled her to make major contributions to this mission during the subsequent 40 years of her close working relationship with Harper.

Together, Katherine and Harper developed intraoperative radiation therapy procedures including iodine-131 "afterloaded" to fine polyethylene tubing threaded through cancerous pancreas tissue; yttrium-90 pellets implanted in the pituitary gland using a transsphenoidal approach; and strontium-90 delivered on the tip of a long, removable needle, also using the transsphenoidal approach. For all such procedures, Katherine performed meticulous measurements and calculations to determine the absorbed radiation dose distribution. As a possible alternative to ^{131}I in some applications, Katherine and Harper developed a method for producing ^{125}I by freezing xenon-124 in a zirconium capsule and then irradiating it in the reactor at ANL. Now widely used in countless radioimmunoassay procedures, ^{125}I is currently produced commercially by essentially the same method.

On the basis of her contributions to quantitative radiation dosimetry, Katherine became chair of the medical radiation dose committee of the Society of Nuclear Medicine, a member of the American National Standards Institute Committee N44.3 on Nuclear Medicine, and a member of the advisory panel on radioactive pharmaceuticals for the United States Pharmacopoeia.

While therapy with radioisotopes remained an important part of its research, the ACRH nuclear medicine team is best known for the clinical introduction of metastable technetium-99 for detecting brain tumors and for a great variety of other diagnostic imaging applications. Annually, ^{99m}Tc is used in approximately 35 million such procedures worldwide.

Katherine always found time to discuss research issues with students and trainees, and in the graduate program of medical physics she gave lucid and well-received lectures on nuclear physics, interactions of radiation with matter, dosimetry, radiochemistry, and radiopharmaceutical science. Those who knew Katherine will remember her with affection, admiration, and respect.

Robert N. Beck
(r-beck@uchicago.edu)
University of Chicago
Chicago, Illinois

Gen Shirane

Gen Shirane, one of the world's foremost authorities on using neutron scattering as a probe of solids, and who for more than half a century was a leader in developing techniques by which high-flux nuclear research reactors were transformed into premier tools for studying condensed matter physics, died of a stroke at his home in Bellport, New York, on 16 January 2005.

Born in Nishinomiya, Japan, on 15 May 1924, Gen received a bachelor's degree in engineering physics from the University of Tokyo in 1947 and worked briefly at the Tokyo Institute of Technology. In the evolving society of post–World War II Japan, he was impatient with the old hierarchical ways of Japanese science; even before receiving his PhD in science from the University of Tokyo in 1954, he set off for Pennsylvania State University, where he worked from 1952 to 1957. His early experiments at Penn State and Tokyo used x-ray scattering, and his scientific interests were in sym-

BROOKHAVEN NATIONAL LABORATORY

Gen Shirane

metry-breaking phase transformations in ferroelectric materials and in the materials' resulting piezoelectric and nonlinear optical properties. During this period he coauthored with Franco Jona a book on ferroelectricity that is a classic reference still used by workers in the field.

In 1957 Gen moved to Westinghouse Research Laboratories in Pittsburgh, Pennsylvania, and his interests broadened to include magnetic materials, the newly discovered Mössbauer effect, and neutron diffraction. The neutron-scattering experiments were carried out mostly at the graphite reactor at Brookhaven National Laboratory. One of Gen's first experiments there was pioneering work with Robert Nathans, Clifford Shull, and Arne Andersen that demonstrated an important method for producing polarized neutrons.

Gen moved permanently to Brookhaven in 1963, as the Brookhaven High Flux Beam Reactor construction was being completed, and he contributed to the development of a suite of experimental instruments. The increased neutron flux made possible inelastic neutron-scattering experiments using the triple-axis spectrometer developed by Bertram Brockhouse in Canada. Optimizing the signal-to-noise ratio in these instruments is an art form in which Gen quickly established himself as a virtuoso, and that expertise led ultimately to his publication, with coauthors Stephen Shapiro and John Tranquada, of the definitive monograph on that subject.

Although his ability to tease signals out of noisy data was phenomenal, it was not his most impressive talent. He had an unerring sense of where neutrons could make a difference in the understanding of the physics of materials and how to develop the techniques needed to perform the requisite experiments, and an ability to attract the collaborators most able to help attack these critical problems. In the 1970s his collaborations led to pioneering studies of low-dimensional magnetic systems, and somewhat later to low-dimensional structural phase transformations as well. Those studies illuminated the increased importance of fluctuations in lower-dimensional systems. Gen was principally responsible for an in-house effort that confirmed the soft-mode theory of structural phase transformations in a variety of systems and discovered previously unenvisioned features, such as interpenetrating incommensurate lattices.

In Gen's body of work, which includes nearly 700 published papers, a further unifying thread involves the properties of superconductors. He performed the first neutron-scattering experiments to show the effect of a superconducting energy gap on phonon linewidths, a key prediction of Bardeen-Cooper-Schrieffer theory. But perhaps the pinnacle of Gen's distinguished career involves his studies in the late 1980s and early 1990s of high-temperature superconductors. All of his experience in perovskite-like structures, magnetism, lower-dimensional phenomena, and superconductivity came together beautifully in that series of experiments. He and his collaborators performed seminal studies of the magnetic fluctuations in both the insulating parent materials and their superconducting counterparts. He also returned to the use of x rays at the National Synchrotron Light Source, combining those experiments with neutron scattering to further the attempts at understanding these materials. While there is not yet a consensus on the detailed mechanism of high-temperature superconductivity, Gen's results provide a crucial foundation for the common belief that antiferromagnetic correlations play a fundamental role.

Gen was very aware that society had entrusted him with an expensive research tool, and he felt personally responsible for seeing that it was used productively. He was unapologetic in his belief that he was a better judge of the merits and probable success of proposed research than a more egalitarian user committee would be. The productivity of the neutron-scattering group at Brookhaven was unsurpassed under his leadership and provides substantial support for his view.

His early emigration notwithstanding, Gen retained an intense interest in Japanese science. He established strong and continuing collaborations between US and Japanese researchers, and through example and constant mentoring he promoted rapid recognition and advancement of younger Japanese scientists.

Gen's scientific achievements have been recognized with a series of honors, including the Warren Award of the American Crystallographic Association (corecipient, 1973), and the Buckley Prize of the American Physical Society (1973). He was inducted into the National Academy of Sciences in 1989 and the American Academy of Arts and Sciences in 1991.

Personally responsible for training an entire generation of neutron scatterers, he is remembered as a stern taskmaster. Ernest Rutherford was said to have once remarked, "I do not let my boys waste their time." Gen would have concurred and added, "Or waste neutrons either." He once said to one of us, "There are only two experiments that matter—the first and the best. And the ultimate is when they are both the same." Nothing less than superior science was ever acceptable to him. Perhaps his most lasting legacy is the many scientists who struggled to meet his exacting standards and who now populate elite research centers worldwide. It falls to them to recall and pass along to a new generation some of Gen's enthusiasm, dedication, and passion for both science and life.

John D. Axe
Lecanto, Florida
Robert J. Birgeneau
University of California, Berkeley
Martin Blume
American Physical Society
Ridge, New York
Stephen M. Shapiro
Brookhaven National Laboratory
Upton, New York

John Michael Ziman

John Michael Ziman died at his home in Aylesbury, England, on 2 January 2005 after a short illness. A towering intellect, John left his mark both in theoretical physics and in his contributions to the broader aspects of science in society.

Born in Wellington, New Zealand, on 16 May 1925, John went to Victoria University College in Wellington, where he received his bachelor's degree, and then Balliol College at Oxford University. At Oxford he studied mathematics and theoretical physics and completed his DPhil in 1951 on the theory of solids. In 1954 he accepted a lectureship at Cambridge University, where he became interested in the electrical properties of metals and transport in metals and alloys; his monumental textbook *Electrons and Phonons: The Theory of Transport Phenomena in Solids* (Clarendon, 1960) remains a delight and inspiration to students and established theorists alike.

It was about this time that John became aware of the long-standing problem surrounding conduction in liquid metals. More than 100 years ago, Gustav Kirchhoff and others had shown that a metal's melting transition had a comparatively small effect on its electrical conductivity. That behavior seemed to go against all the current thinking in solid-state physics, which in the 1950s emphasized the role of order. Given the catastrophic collapse of long-range order at the melting transition, why was the conductivity not likewise greatly reduced?

By a brilliant application of diffraction theory combined with the new idea of the pseudopotential, John produced his seminal *Philosophical Magazine* paper in 1961. The "Ziman formula" essentially explains all the significant properties of liquid metals and is now standard textbook fare. That work was arguably John's greatest achievement. It was often said that after his work and subsequent studies that his approach had stimulated, we had a better understanding of the liquid state (which until 1961 had appeared intractable) than we had of solids!

John left Cambridge in 1964 and moved to Bristol University as a professor of theoretical physics. He created a leading school of theoretical physics at Bristol by appointing young theorists such as Michael Berry, Balazs Gyorffy, and Bob Evans. John continued to make outstanding contributions to the theory of solids and liquids. A more general interest in disorder finds its expression in his last book on theoretical physics, *Models of Disorder: The Theoretical Physics of Homogeneously Disordered Systems* (Cambridge U. Press, 1979).

In 1976 John became head of the physics department at Bristol. He had a lasting influence on the teaching side by creating a joint degree with the department of philosophy. Around the same time he became increasingly interested in the social and ethical aspects of science. He had already made one excursion into this general area by writing, with Jasper Rose, the book *Camford Observed* (Gollanzc, 1964), a tongue-in-cheek analysis of some of the foibles of the ancient and famous universities of Oxford and Cambridge. Some members of those distinguished establishments apparently felt rather let down by what was perceived as an attack by one of their own. In fact the two authors were arguing that the Oxbridge model was but one of many that could be used in the higher education sector.


UNIVERSITY OF BRISTOL
John Michael Ziman

With his book *Reliable Knowledge: An Exploration of the Grounds for Belief in Science* (Cambridge U. Press, 1978), John completed a major contribution to the sociology of science. Because he felt that to occupy a chair in theoretical physics would be inconsistent with his new field of research, he took voluntary early retirement from Bristol in 1982. His services were rapidly in demand, and he accepted a visiting position at Imperial College London, where he could pursue in depth the role of science and scientists in the wider society. He became an influential director of the science policy support group and also chaired the council for science and technology between 1976 and 1986.

His output from 1990 to 2004 was immense both in volume and influence. Notable written contributions include *Prometheus Bound: Science in a Dynamic Steady State* (Cambridge U. Press, 1994) and *Real Science: What It Is, and What It Means* (Cambridge U. Press, 2000). John came to view with alarm the growth of managed science. His phrase "post-academic science" defined a science that seeks an immediate economic payoff. Such a system, where the laws of intellectual property are more important than the laws of physics, can lead to personal and institutional corruption. John's wise words in *Prometheus Bound*, which emphasize the dangers of ignoring the importance of curiosity-driven science, should be read, noted, and digested by all those who support science and influence its direction. "Society," he declared, "needs a model of critical rationality for the proper conduct of democratic debate, judicial inquiry, and consumer protection."

John received many awards and honors during his distinguished career, but he was particularly pleased that his alma mater, Victoria University, made him an honorary DSc and that the Royal Society appointed him to the Rutherford Memorial Lectureship. The lectures associated with that award were delivered in India and Pakistan, countries where—before partition, of course—his father had served so loyally in the Indian Civil Service.

John left as legacies a thriving theoretical group at Bristol and a stellar array of books, papers, and pamphlets. Above all, he will be remembered for his sharp intellect, his integrity, and his commitment to scholarly debate and analysis. He will be greatly missed.

John Enderby
Institute of Physics
Bristol, UK ■