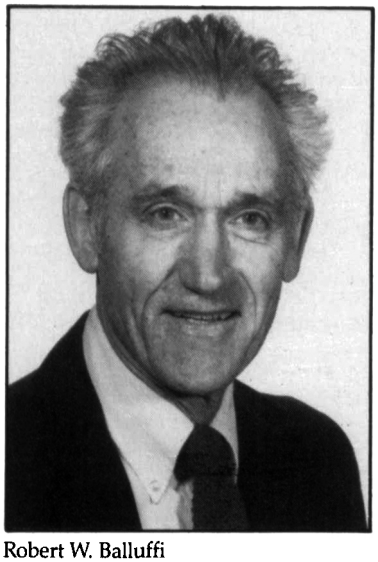
Robert W. Balluffi Receives Von Hippel Award for Distinguished Interdisciplinary Materials Research



Robert W. Balluffi

Robert W. Balluffi, whose research on grain boundaries in metals, ceramics, and semiconductors has shed considerable light on a wide range of important fundamental scientific and technological problems, will receive the 1990 Von Hippel Award at the MRS Fall Meeting in Boston. Following the presentation, Balluffi will deliver a guest lecture entitled, "In Pursuit of the Lattice Vacancy."

A professor of physical metallurgy at Massachusetts Institute of Technology since 1978, Balluffi is being recognized "for his seminal experimental and analytical contributions, which have clarified our fundamental understanding of the atomic mechanisms of sintering, Kirkendall phenomena, dislocation climb, solid-state diffusion, the production and recovery of radiation damage, grain boundary structure and energetics in metals and ceramics."

Interdisciplinary Science

Balluffi's research has always sought fundamental answers to very basic questions, say his colleagues, and this has required tapping knowledge from disciplines outside physical metallurgy, in which he received his formal training. Although most of his research has dealt with metals (with some on semiconductors and ceramics) his experiments have nucleated similar research on other materials.

According to David N. Seidman, professor of materials science and engineering at Northwestern University, who has known Balluffi since 1962, "The classic length-change and lattice-parameter change experimental techniques of Ralph Simmons (professor of physics, University of Illinois at Urbana-Champaign) and Balluffi—on fcc metals and alloys—have been applied by Simmons and his students to ionic materials and to rare gas crystals. The lack of precise and accurate Simmons-Balluffi type experiments on bcc metals and semiconductors has led to much controversy concerning the dominant point defect in thermodynamic equilibrium in these materials."

Scientists including Balluffi himself have taken his findings on grain boundaries in gold and applied them to the study of ceramics and semiconductors. Also, his theoretical studies on the question of grain boundary energies have led to much additional theoretical and experimental research on the thermodynamic and kinetic properties of grain boundaries.

"The field of grain boundaries has literally exploded since 1970," says Seidman. "That was when Tilman Schober (senior research scientist, Kernforschungszentrum Jülich, Germany) and Balluffi published their now classic paper that so beautifully demonstrated that it is possible to fabricate grain boundaries with a known orientation and to study systematically their dislocation structure by transmission electron microscopy."

Merton C. Flemings, Balluffi's colleague at MIT, concurs. "Grain boundaries and grain boundary structure lie at the heart of a wide variety of important technological problems," he says. "Professor Balluffi's basic work is key to the understanding we are developing of these grain boundaries, and his own interest and expertise stretch from the basic phenomena involved to the applied scientific aspects of these important problems."

In addition to being regarded as experimentally and analytically brilliant, Balluffi's research holds technological promise as well. For example, his early papers on sintering, written in the 1950s, have been critical to understanding this phenomenon. More recently Balluffi's research on radiation damage has contributed greatly to understanding the swelling of metals under irradiation.

Impact Outside His Field

Balluffi's presence has been felt outside his immediate professional field. His pioneering work on amorphization of germanium (conducted in the early 1960s) and the crystallization of amorphous germanium due to particle irradiation led to a discipline that is now an active research area for many laboratories worldwide.

Balluffi's work on the equilibrium concentrations of vacancies (the "Simmons-Balluffi" experiment) has had widespread influence on thinking about point-defect mechanisms and diffusion. "Without these experiments," says Seidman, "our atomistic picture of diffusion would be clouded by many conflicting possibilities, rather than being the reasonably clear picture we have at present for fcc metals and alloys. These experiments and their interpretation have not only had a major impact on the study of point defects but they have also provided the basis for understanding many transport phenomena on an atomic scale."

Other Honors

An MIT graduate (with BS and ScD degrees in metallurgy), a member of the National Academy of Sciences, and a Fellow of the American Academy of Arts and Sciences, Balluffi has been honored internationally with the 1989 David Adler Lectureship Award of the American Physical Society, an Acta Metallurgica Gold Medal, a Japan Society for Promotion of Science Fellowship Award, and an Alexander von Humboldt Senior Scientist Stiftung. He is also an Institute of Metals Lecturer and R.F. Mehl Gold Medalist.

Balluffi was senior research engineer with Sylvania Electric Corporation Research Laboratory from 1950-54; assistant and then associate professor in the Department of Mining, Metallurgy and Petroleum Engineering at the University of Illinois at Champaign-Urbana from 1954-64; and Francis Norwood Bard Professor and then director of the Department of Materials Science and Engineering at Cornell University, where he served from 1964-78. With approximately 200 publications to his credit, Balluffi is currently writing a book, *Intercrystalline Interfaces*, with Adrian P. Sutton of the University of Oxford. MRS

The Von Hippel Award

The Von Hippel Award, bestowed annually by MRS since 1977, recognizes scientists whose work has had a major impact on materials research and exemplifies an interdisciplinary approach. It includes a cash prize and a mounted ruby laser crystal symbolizing the many-faceted nature of materials science. Named for its first recipient, Arthur R. von Hippel, the award is the Society's highest honor, says R.P.H. Chang, chair of the MRS Von Hippel Award Subcommittee. "The Von Hippel Award recognizes those qualities most prized by materials scientists and engineers—brilliance and originality of intellect, combined with vision that transcends the boundaries of conventional scientific disciplines."

1977 **Arthur R. von Hippel**
Emeritus Professor, Massachusetts Institute of Technology

1978 **William O. Baker**
Emeritus Chairman of the Board, Bell Laboratories

1979 **David Turnbull**
Gordon McKay Professor of Applied Physics, Harvard University

1980 **W. Conyers Herring**
Professor of Applied Physics, Stanford University

1981 **James W. Mayer**
Francis Norwood Bard Professor of Materials Science and Engineering, Cornell University

1982 **Clarence M. Zener**
Emeritus University Professor, Carnegie Mellon University

1983 **Sir Peter B. Hirsch**
Isaac Wolfson Professor of Metallurgy, University of Oxford

1984 **Walter L. Brown**
Head of the Radiation Physics Department, AT&T Bell Laboratories

1985 **John W. Cahn**
Senior Fellow, Center of Materials Science, National Bureau of Standards

1986 **Minko Balkanski**
Professor of Physics and Director of the Solid State Physics Laboratory, University of Pierre and Marie Curie

1987 **Sir Charles Frank**
Professor Emeritus, University of Bristol

1988 **Jacques Friedel**
Head of Physics Department, University of Paris

1989 **John B. Goodenough**
Virginia H. Cockrell Centennial Chair of Engineering, University of Texas at Austin

https://doi.org/10.1557/S0883769400058401 Published online by Cambridge University Press