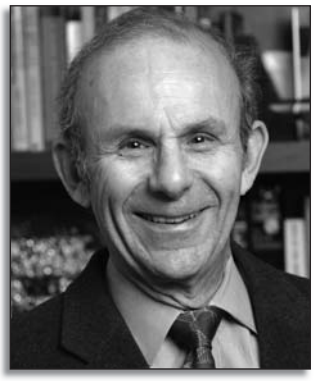
David Seidman Selected for 2008 David Turnbull Lectureship

The Materials Research Society's David Turnbull Lectureship recognizes the career of a scientist who has made outstanding contributions to understanding materials phenomena and properties through research, writing, and lecturing, as exemplified by David Turnbull of Harvard University. This year, David Seidman, Walter P. Murphy Professor of Materials Science and Engineering, Northwestern University, Evanston, Illinois, has been selected to deliver the 2008 David Turnbull Lecture. Seidman is cited for "research that has made major contributions to our understanding of point defects and the role they play in radiation damage and phase transformations; unique studies of interfacial segregation; and especially for the development and fruitful use of atom-probe spectrometry; for numerous seminal publications, and excellence in education/training students and colleagues in the laboratory, classroom, and conferences." He will be presented with the award at the 2008 MRS Fall Meeting in Boston, during the awards ceremony on Wednesday, Dec. 3, at 6:00 p.m. in the Grand Ballroom at the Sheraton Boston Hotel. Seidman will deliver his award lecture during the conference, on Dec. 3, at 5:05 p.m. in Hynes Convention Center, Room 210.

Seidman's research has led to major advances in the understanding of the behavior of vacancies and self-interstitial atoms in metals, particularly in connection with radiation damage and dislocation interactions. He is a pioneer and current leader in the use of field-ion spectroscopy (FIM) and three-dimensional (3D) atom-probe tomography to study interfaces, segregation, and precipitation in metals and metal alloy systems on an atomic scale. Seidman has published more than 325 articles, most of them appearing in premier archival journals, and he has edited or co-edited eight books. He has delivered numerous symposia and conference presentations, and has organized or co-organized some 25 conferences, primarily concerning various aspects of materials characterization. He has also supervised the thesis research of about 70 PhD candidates and postdoctoral fellows, many of whom have achieved outstanding careers in academia, government, and industry.

At the beginning of his career, Seidman used up-quenching and down-quenching experiments to demonstrate a fundamental asymmetry in the way dislocations climb in the presence of sub- and supersaturation of vacancies. He found a correlation between the chemical potential of a vacancy and the efficiency of dislocation climb. As a young professor at Cornell, he established the first known laboratory in the world to use FIM to quantitatively study the fundamental properties of point defects in quenched and irradiated metals. As part of his research, he measured the elastically deposited energy of implanted ions as a function of depth.



David Seidman

After the invention of the atom-probe FIM by E.W. Müller, J.A. Panitz, and S.B. McLane in 1968, Seidman designed a fully computer-controlled instrument, which set the standard for future atom probes fabricated worldwide. He used the ultrahigh vacuum atom-probe FIM to study the diffusivity and migration energies of ^{3}He and ^{4}He in metals. These properties are important for modeling the precipitation behavior of implanted helium in reactor materials.

On his arrival at Northwestern University, Seidman changed his field of research to the study of interfacial segregation in metals because of its importance in many phenomena in materials science and engineering. He developed a procedure to solve the difficult problem of using the FIM to study grain boundaries in the vicinity of a tip. He also developed computer simulations of grain boundary segregation, using Monte Carlo techniques and embedded atom potentials. A major result of Seidman's research in grain boundaries is the proof that the five macroscopic degrees of freedom are thermodynamic state variables, as postulated by J.W. Cahn.

In parallel with his research on segregation in metals, Seidman instituted a program on segregation at heterophase interfaces for ceramic/metal systems, using both experiment and simulation. He used this study to prove that the measured coherency of an interface depends on the instrument used to detect the misfit dislocations. Within the last few years, Seidman and his group have used a state-of-the-art 3D-LEAP atom-probe tomography instrument to study interfacial segregation in a series of metal oxide/metal heterophase interfaces. The goal of this research is to determine selection rules for predicting which elements segregate at the interface. This approach has been used to study low density TiAl alloys, which have the potential for use at high temperatures in jet- and land-based gas-turbine engines. Seidman's research suggests a technique for reducing the brittleness of these alloys at low temperatures.

After obtaining a PhD degree in physical metallurgy (major) and physics (minor) at the University of Illinois at Urbana-Champaign in 1965, Seidman accepted a postdoctoral associate position in the Department of Materials Science and Engineering at Cornell University, where he was appointed assistant professor in 1966, associate professor in 1970, and professor in 1976. In 1985, Seidman accepted a professorship in Materials Science and Engineering at Northwestern University, where he was appointed to his current position in 1996. He is also founder and director of the Northwestern University Center for Atom-Probe Tomography.

During his career, Seidman has accepted many positions as visiting scientist: Visiting Senior Lecturer, The Technion–Israel Institute of Technology (1969); Visiting Associate Professor, Tel-Aviv University (1972); Lady Davis Visiting Professor, The Hebrew University of Jerusalem (1978, 1980–1981); Visiting Scientist, Centre National d'Etudes des Telecommunications, Meylan, France (1981); Visiting Scientist, Department de Recherche Fondementale, Grenoble, France (1981); Summers Visiting Scientist, Argonne National Laboratory (1984–1985); Alexander von Humboldt Senior Fellow, University of Göttingen, Germany (1989, 1992); and Visiting Scientist, Centre de Recherches Nucleaires de Saclay, France (1989). He was also head of the Division of Materials Science, The Hebrew University, Jerusalem (1983–1985) and a scientific consultant to Argonne National Laboratory (1985–1994).

Among Seidman's many awards were the Robert Lansing Gold Medal of the American Institute of Metallurgical Engineers (now the Minerals, Metals, and Materials Society, or TMS) in 1966, the Alexander von Humboldt Stiftung Prize in 1989 and 1992, and the Albert Sauveur Achievement Award, ASM International in 2006. He has been a fellow of the American Physical Society since 1984, and he is also a fellow of TMS and of ASM International.