

## 2008 Richard C. Lord Lecture

### Mildred Dresselhaus

### Raman spectroscopy of nanotubes and other nano-carbon systems



**Tuesday, May 6, 2008, 12 noon  
MIT, Grier Room (34-401)**

Refreshments served following the lecture

Sponsored by  
The George R. Harrison Spectroscopy Laboratory and  
The Department of Chemistry  
Massachusetts Institute of Technology

Mildred Dresselhaus is one of the best known professors at MIT. She holds faculty positions in both the Department of Electrical Engineering and Computer Science and the Physics Department and is an Institute Professor, a special honor reserved for only a few MIT faculty members who distinguish themselves amongst their peers. Her carbon nanotube research, conducted in the Spectroscopy Laboratory, has merited worldwide acclaim. Millie, as she is affectionately known, is also well-known for her very effective efforts in educating and advancing women and minority students and scientists.

Millie was born in New York City in 1930. She received her undergraduate education at Hunter College, followed by one year at Cambridge University and one at Harvard University. She received her Ph.D. degree from the University of Chicago, studying microwave properties of superconductivity in a magnetic field. Following her doctoral studies, she spent two years at Cornell University. In 1960, she became a staff member in the Solid State Physics Division of MIT Lincoln Laboratory.

Her move to Lincoln Laboratory coincided with her switching research fields to magneto-optic studies of semiconductors and semimetals at high magnetic fields. In 1962 she conducted the first magneto-optic studies of graphite, which elucidated many new aspects of the electronic structure of this remarkable semimetal. In her quest for higher resolution, she joined forces with Ali Javan in 1966 to conduct the first high field magneto-optic study with a laser source. This study broke new ground in magneto-optic technology and at the same time led to a major advance in our understanding of the electronic structure of graphite as we know it today, with the first correct identification of the location of electrons and holes in the Brillouin zone. These experiments led, in 1973, to the first spectroscopic studies of carbon nanostructures in terms of graphite intercalation compounds. They were followed by studies on liquid carbon, fullerenes, carbon nanotubes, graphene and graphene ribbon, all of which are forefront research topics today.

Millie joined the MIT faculty in 1968. She served as MIT Associate Department Head of EECS (1972-1974), and as Director of the MIT Center for Materials Science and Engineering (1977-1983). She served as the Director of the Office of Science at the Department of Energy (2000-2001).

Millie has served as President of the American Physical Society, Treasurer of the National Academy of Sciences, and Chair of the Governing Board of the American Institute of Physics. She is also a member of the National Academy of Engineering and a Fellow of the American Academy of Arts and Sciences. Millie's many awards include the National Medal of Science and 24 honorary doctorates worldwide. Most recently, she is the 2008 recipient of the Oersted Medal for Physics Education from the American Association for Physics Teachers, and of the 2008 Buckley Prize for Condensed Matter Physics from the American Physical Society.

Millie lives in Arlington with her husband and research colleague Gene, a theoretical solid state physicist. They have four grown children. For relaxation, Millie is an enthusiastic chamber music player, playing both violin and viola.

*Richard C. Lord* was born in Louisville, Kentucky in 1910. He was graduated from Kenyon College, Ohio in 1931. He received the Ph.D. degree in physical chemistry from Johns Hopkins University in 1936, where he began a long and distinguished career as a scientist and educator. In 1942, Lord came to MIT. He was appointed Professor of Chemistry in 1954 and was Director of the Spectroscopy Laboratory from 1946 to 1976. He died in 1989.

Lord's research contributions were in the infrared and Raman spectroscopy of polyatomic molecules. His achievements include the observation and interpretation of Coriolis-activated forbidden vibrational transitions, the synthesis and complete vibrational analysis of a large number of deuterated molecules, and the discovery and exploitation of the anomalous far infrared spectra of ring molecules. Toward the end of his career he became interested in biomolecules. His studies of the laser Raman spectra of proteins and nucleic acids opened a new field of research.

Lord was also a dedicated teacher and an inspired supervisor of graduate students. His summer course in spectroscopy, held first at MIT and then at Bowdoin College, attracted more than 2000 scientists.

Lord had a major impact on the development of the Spectroscopy Laboratory. During his thirty year tenure as Director, the Laboratory became an Interdepartmental Laboratory of the School of Science, with broadened faculty participation. Research activities expanded from the study of atomic spectra using visible light and large gratings to include visible-UV electronic molecular spectra, molecular vibrational spectra using classical infrared and far infrared sources, and then to the use of lasers. During this period the Laboratory pioneered in a wide variety of vibrational studies of molecules and Raman studies of biomolecules, some of them mentioned above, as well as in seminal laser studies of the stimulated Raman and Brillouin effects and the use of lasers for precision measurements and ultra-high resolution spectroscopy.

Lord received the Presidential Certificate of Merit in 1948, and the Award in Spectroscopy from the Pittsburgh Spectroscopy Society in 1966. He served as president of the Commission of Molecular Spectroscopy of the International Union of Pure and Applied Chemistry, and was president of the Optical Society of America, and received the Lippincott Medal from them in 1976. He was also a fellow of the American Academy of Arts and Sciences.

The annual Richard C. Lord Lecture has been established as a tribute to the memory of Dr. Lord.

The Richard C. Lord Lecture is an annual event sponsored by MIT's G.R. Harrison Spectroscopy Laboratory and Department of Chemistry to honor a scientist who has made important contributions to the field of spectroscopy. We thank the many friends and colleagues of Dr. Lord for their generous contributions to the endowment fund.

Past Awardees:

Takeshi Oka 1992

Alexander Pines 1993

Charles Townes 1994

Richard Zare 1995

Carl Lineberger 1996

William Klemperer 1997

William Phillips 1998

Theodor Hänsch 1999

Daniel Kleppner 2000

Steven Chu 2001

Norman Ramsey 2002

Britton Chance 2003

Watt Webb 2004

Robert Field 2005

John Hall 2006

Graham Fleming 2007