Professor Mildred Dresselhaus is a native of the Bronx, and attended New York City public schools through junior high school, and Hunter College High School. She began her independent career in 1960 as a member of the research staff at the MIT Lincoln Laboratory after her PhD at the University of Chicago (1958) and a two-year postdoc at Cornell University. During that time she switched from research on superconductivity to magneto-optics, and carried out a series of experiments which led to a fundamental understanding of the electronic structure of semimetals, especially graphite. This led to her appointment as an MIT faculty member and eventually to appointment as an Institute Professor in the departments of Physics and Electrical Engineering. She served as the Director of the Office of Science at the US Department of Energy in 2000-01, and has been an officer in many national organizations in physics, engineering, and related areas. Honors and awards include 30 honorary doctorates worldwide. Other honors include the National Medal of Science, the Nicholson Medal for Humanitarian Service, the Compton Award, the Fermi Prize, and the Kavli Prize.

Professor Dresselhaus’s research over the years has covered a wide range of topics in condensed matter and materials physics. She is best known for her work on carbon science and carbon nanostructures, as well as nanoscience and nanotechnology more generally. She is also one of the researchers responsible for the resurgence of the thermoelectrics research field through her early work on low-dimensional thermoelectricity in the early 1990s. She co-chaired a Department of Energy study on “Basic Research Needs for the Hydrogen Economy” in 2003 and more recently co-chaired the National Academy Decadal Study of Condensed Matter and Materials Physics. She has co-authored more than 1400 publications including books, book chapters, invited review articles, and peer-reviewed journal articles. She is co-inventor on six US patents. Dr. Dresselhaus remains involved in activities that promote the increased participation of women in science and engineering. She is an enthusiastic chamber music player where she plays violin and viola, and enjoys spending time with her husband, four children, and five grandchildren.
Professor Dresselhaus will give 3 lectures during her visit, as described below:

Lecture 1: Why are People Interested in the Nano World?

Monday, April 22 at 3 p.m.
Earth Sciences Centre ES1050
33 Willcocks Street

This is the 2013 Boris P. Stoicheff public lecture, sponsored by the Institute for Optical Sciences at the University of Toronto. For more information please call 416-978-1804.

Materials research has been a rapidly growing field since the 1930s. In the early years of the field the focus was on simple materials like alkali halides, which is basically common table salt. Companies like the Bell Telephone Company and International Business Machines (IBM) worked hard on the purification of silicon and germanium which led to semiconducting electronics and communications, and the hardware for the information age. Magnetic materials followed a similar trajectory Devices got smaller and smaller, and at the same time increasingly powerful, ushering in the use of Moore’s law and making the space age possible. Magnetic devices kept pace with semiconducting devices for both computation and memory/information storage, transforming daily life and industrial development. The 1990s ushered in the nanostructure age. Nanoscience and nanotechnology, together with nanomanufacturing, are now keeping Moore’s law moving forward. Looking to the future, what will materials research do for society?

Lecture 2: Nanoscale Phenomena

Tuesday, April 23 at 2 p.m.
Bahen Centre for Information Technology BA1130
40 St. George Street

Nanoscience is strongly influenced by the physical properties of nanostructures since materials at the nanoscale differ from in properties from the same material at larger scales. Nanoscale materials are more sensitive to the behavior of the interactions between electrons and between phonons, which denote the lattice vibrations of the constituent atoms. This talk will focus on my 40-year adventure with carbon nanostructures in the context of nanoscience, and end with the present research focus of my group.

Lecture 3: Perspectives on Thermoelectric Materials

Wednesday, April 24 at 2 p.m.
Bahen Centre for Information Technology BA1130
40 St. George Street

An introduction will be presented in setting the context of the world energy outlook as we look into the future global energy needs. Thermoelectricity has played a small role on the energy scene in the past, but with an increase in the thermoelectric conversion efficiency, thermoelectric materials are likely to play an increasing role in the future. Because of the special ability of nanomaterials to show a dependence of materials properties on size, it is possible to control properties in low-dimensional materials systems that cannot be independently controlled in bulk materials. Such independent control is especially promising for thermoelectric materials and this promise will be further discussed.

For more information on this lecture series please contact Emanuel Istrate.