Mildred S. Dresselhaus

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Among the scientific awards he received were the 1998 L. D. Landau Gold Medal, the 2004 Eugene Feenberg Memorial Medal, and the 2012 Pomeranchuk Prize.

Neither years nor prizes changed Spartak's unique personality. Even into his nineties, the routine of his everyday life involved a daily half-hour walk from home to the office and back. While visiting Lake Michigan in 2004, he taught several younger people the correct dune-climbing technique. He never took medicine, which was not good during his fatal illness. He will stay in our memory as a great scientist and a superb human being.

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Mildred S. Dresselhaus

Mildred S. Dresselhaus, Institute Professor in the departments of electrical engineering and physics at MIT and a world-renowned condensed-matter physicist, passed away on 20 February 2017. Affectionately known as "Millie," she was an extraordinary human being who left an unforgettable, energetic imprint as a scientist, mentor, and friend. Her achievements have been widely recognized with the highest awards in science. She also had a significant impact on governmental science, education policies, and the advancement of women in science; she cared particularly for the success of the young generation.

Born in Brooklyn, New York, on 11 November 1930, Millie earned her bachelor's degree in physics from Hunter College in 1951 and her master's in physics in 1953 from Radcliffe College. She continued her PhD studies at the University of Chicago, in close contact with Enrico Fermi, and in 1959 defended her PhD thesis in physics, titled "Magnetic field dependence of the surface impedance of superconducting tin," under the formal supervision of Andrew Lawson.

Millie's lifetime of contributions has been described in many venues following her passing. As her longtime collaborators and friends, we share here some perhaps lesser-known aspects of her life. The "Queen of Carbon" advanced research in many aspects of nanostructured materials, and her expansive work on carbon-based nanostructures in particular spanned from the 1960s to the last week of her life.

In the 1960s Millie was the first to use magneto-optic measurements on graphite to properly identify electron and hole states in the Brillouin zone. In the 1980s she did important work with graphite intercalation compounds, a key component in today's lithium-ion batteries and two-dimensional materials. Her involvement with graphitic carbons grew, and the emergence of fullerenes, vapor-grown carbon fibers, carbon nanotubes (NTs), graphene nanoribbons, and low-dimensional thermoelectricity in the 1990s ignited her interest in nanoscale structures. In close collaboration with colleagues, particularly in Japan, Brazil, and the US, she investigated structures of graphene rolled up into carbon NTs.

In the late 1990s, Millie developed the use of resonance Raman spectroscopy to study single-wall carbon NTs. The technique was particularly useful for characterizing the properties and quality of nanocarbons, including fullerenes, carbon NTs, and novel 2D materials, and it led to the unveiling of the importance of electron–phonon interaction in those systems. Her insight into graphitic nanostructures created the foundation for a simple quantitative description of optical and vibrational spectra of nanocarbons, including the dependence of the NT energy bandgap on the chiral index and of the radial breathing mode frequency on the tube diameter.

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In the following years, Millie got involved in the synthesis and characterization of doped NTs, graphene nanoribbons, and 2D materials. Being an expert in "any kind of carbon material" had not precluded her from contributing significantly to other areas of nanotechnology, including the recently discovered phosphorene and 2D materials such as tungsten disulfide, tungsten diselenide, and molybdenum disulfide. Equally important is her groundbreaking contribution to bismuth compounds used in thermoelectrics and topological insulators.

Millie was intimately involved with the series of NT conferences since they were first organized in 1999. In each of the 17 NT conferences to date, which took place on five continents and attracted hundreds of participants, not only was Millie a frequent invited speaker, but she took charge of the conference summary. She always sat in the front row and wrote notes for the length of the conference. With support of young scientists, her notes were turned into slides for her summary presentation at the conference's end. In her summary, she reviewed highlights and emerging challenges and suggested new directions for future research. For over a decade, Millie impressed audiences with her wisdom, energy, knowledge, sharpness, and modesty. With her continuous support, the annual NT conferences have evolved into the most prominent international NT event.

Knowing firsthand the obstacles faced by women in science and engineering—her own PhD adviser told her there was no place for women in physics—Millie worked throughout her career to improve the climate for them. She served from 1975 to 1977 on the National Research Council's Committee on the Education and Employment of Women in Science and Engineering, an early and influential effort on the subject, and up until her death, she regularly offered encouragement and guidance to women students and postdocs at schools where she had been invited to speak.

Through her life's work, Millie proved wrong her PhD adviser's prejudice against women in physics. She was a well-organized and hard-working scientist. Her workdays started at 5:30am and ended late at night. She kept a tight schedule that included research, daily family activities, and violin and viola playing, often as part of informal chamber music sessions with her family members, colleagues, and friends. She was extremely responsive in answering emails, reviewing papers and proposals, and preparing presentations. She never wasted her time.

Like a mother to her extended research family, Millie stimulated, challenged, and found the potential of her students and collaborators. Her hard work and service helped shape the careers and lives of many young people worldwide. As a teacher and mentor, she inspired many generations and will always be a role model. Even though emails, phone calls, faxes, and visitors kept her constantly busy, the door of her MIT office was always open. Her kindness and availability to help were off the scale.

When traveling, Millie always carried a heavy handbag filled with drafts of manuscripts to review. All told, she authored, coauthored, and edited around 1700 papers and books with her green and blue pens. At her destination, she would ask her hosts to fax or to scan and email the hand-corrected manuscripts to her coauthors or staff. Her hard work was supported by her husband, Gene, also a physicist at MIT; by colleagues and dedicated staff members at MIT; by her collaborators and family members; and by many friends in the chamber music sessions.

Millie has left a legacy of promoting science and influencing the new generation of scientists. Her passion for life and science lasted until the very last week of her life and will continue motivating many people, especially women, around the world. We will miss the Queen of Carbon. We will miss her smile, ideas, brilliance, lessons, generosity, modesty, and guidance. We are certain that she is watching us now, along with her old friends, from heaven or the metaspace.

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Anthony Philip French

Anthony Philip French, MIT professor emeritus in physics, died on 3 February 2017. French was singularly committed to the importance of physics teaching, and he achieved wide recognition for his influence on the teaching of physics at MIT, his five highly respected textbooks, his role in international efforts to improve physics education, his contributions to ongoing debates about goals and purposes of physics teaching, and his leadership in the American Association of Physics Teachers (AAPT).

Born on 19 November 1920 and raised in Brighton, England, French started undergraduate work at Cambridge University in 1939 just as World War II began. His interest in nuclear physics was awakened by Egon Bretscher, a Swiss physicist teaching at Cambridge. After graduating in 1942, French was recruited by Bretscher into the Tube Alloys Project, Britain's nuclear bomb program. In 1944 the program merged with the US's Manhattan Project, and French was sent to Los Alamos. There, working for Edward Teller's small group exploring the possibility of a fusion bomb, French measured cross sections for reactions of light nuclei, such as $d + d \rightarrow p + {}^3H$ and $p + {}^3H \rightarrow n + {}^3He$. His results showed that a fusion bomb was in principle feasible.

Los Alamos was an unforgettable experience for French. He was 23 and barely educated in physics when he was suddenly removed from grim wartime Britain and set down in the scenic mountains of New Mexico, where he could have oranges and eggs and work with some of the best and most famous physicists in the world.

After the war, French married Naomi

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Livesay, a mathematician from Montana who worked in Richard Feynman's computing group at Los Alamos. They honeymooned by touring the American Northwest in an auto bought from Klaus Fuchs—who was later discovered to have given atomic-bomb secrets to the USSR. French and his wife then moved to England, where he joined the Cambridge University faculty and completed his PhD using declassified results from his Los Alamos work.

In 1955 French moved to the University of South Carolina, and shortly afterwards he became physics department chair. Over the next six years, as he hired faculty to bring physics research into the department, his own interests shifted from research to teaching, and he wrote his first textbook, *Principles of Modern Physics* (Wiley, 1958).

His book was admired by Jerrold Zacharias, the MIT professor leading the Physical Science Study Committee (PSSC) effort to reform physics teaching in US high schools. Zacharias wanted to introduce the modern outlook of the PSSC into college and university physics teaching, and he recruited French to MIT to help do it.

French developed a novel curriculum for an experimental introductory physics course at MIT. When he proposed to expand his course to include a few more students from the regular course, the department head said, "That's of no use to me. Take the whole thing," and French