OBITUARY

Mildred S. Dresselhaus (1930–2017)

Mildred (Millie) Dresselhaus, a pioneer and world leader in nanoscience, passed away on 20 February 2017. One of the most influential scientists of our time, she was an extraordinary researcher who always went out of her way to help everyone she encountered. Millie co-authored eight books and ~1,700 papers, and her contributions to the scientific and global communities won her awards including the Presidential Medal of Freedom, the National Medal of Science, the Kavli Prize for Nanoscience and many others. Millie was dedicated to her work to the very end, and continued mentoring students until her final day.

Millie was born on 11 November 1930, in Brooklyn, New York, and was raised in poverty by immigrant parents. Nobel Laureate Rosalyn Yalow became her mentor during her undergraduate years, and encouraged her to pursue graduate work. Through a Fulbright Fellowship Millie continued her education at the University of Cambridge, where she learned the fundamentals that would help her to establish herself as a physicist. She received her MA in Physics from Radcliffe College at Harvard University, and her PhD from the University of Chicago. At the University of Chicago, Millie became friends with Enrico Fermi during their long morning walks to the lab. She credited his quantum physics course for teaching her to think like a physicist, and she spoke of how his support and mentorship inspired her for the rest of her life.

Millie and her husband Gene, whom she met during her PhD, became staff members at MIT's Lincoln Laboratory in 1960. In 1967, Millie became the Abby Rockefeller Mauze visiting professor in the Department of Electrical Engineering at MIT and was hired into a permanent position after one year. She later received a joint appointment in physics, and another appointment across all departments as an institute professor. Millie was MIT's first woman to become a tenured professor in engineering and to become an institute professor — the highest honour for MIT academics. Throughout her 50 years at MIT, Millie was a prominent influence on campus with her active and vibrant presence.

Millie was one of the foremost experts in the study of carbon science, and during

NATURE AND SCIENCE/ALAMY STOCK PHOTO

her career she worked on all carbon-based materials. She began by publishing extensive work on graphite intercalation compounds, which have important materials implications in batteries for energy storage.

Millie was also one of the first to predict the existence of carbon nanotubes, based on a link between fullerenes and carbon fibres, and her vision, with that of others like Richard Smalley contributed to the first observation of carbon nanotubes in 1991. Her theoretical work showed that single-walled nanotubes (SWNT) could be semiconducting or metallic depending on their geometric structure. This work stimulated experimental efforts to synthesize, characterize and separate SWNTs, and encouraged investigation of their fundamental physics and applications. Millie also developed SWNT Raman spectroscopy, which has revolutionized our understanding of how macroscopic characterization can probe single molecules. Her Raman work has enabled breakthroughs in fields as diverse as catalyst research, single molecule sensors and DNA hybridization.

Beyond carbon, Millie also pioneered the use of nanostructures in thermoelectrics, defining the modern direction of the field. Millie's 1993 papers proposed the possibility of increasing, for the first time, the figure of merit (ZT) of a material by preparing it into a quantum-well superlattice structure or one-dimensional nanowire-like form. Her seminal papers on this topic, cited more than 2,000 times, enabled the experimental breakthroughs in the ZT value of nanostructured thermoelectrics, and helped usher in the age of nanotechnology.

Millie has also been a prominent advocate for women pursuing a career

in STEM. As a mother of four, Millie managed to never sacrifice her family for success in her career. In 1971, she and a colleague created the first Women's Forum for students at MIT to explore the roles of women in science and engineering. She later founded a first-year course for undergraduate engineering students to explore the scope of engineering. Originally designed to help women, it continues to draw a large audience of men and women trying to focus their career aspirations. Millie always made an effort at conferences or seminars across the world to meet and encourage female students. She was a mentor and an inspiring role model for women worldwide.

Equally remarkable was her local and global service to the scientific community. At MIT, Millie served in high level positions for a few departments, allowing her to help many early professors. In 1999–2000, she served as the Director of the Office of Science at the US Department of Energy. She also served in executive positions for the American Institute of Physics, the American Physical Society, the National Academy of Sciences, and the American Association for the Advancement of Science, and was on the board of countless other advisory committees. She felt passionately about these civic and social duties as a result of the opportunities that she had during her childhood and as a young woman. She always declared her gratitude to her country, which had allowed her to become who she was.

Through her endeavours, her impact and her legacy, Millie's contributions to science and society will be sorely missed, but will endure for many generations still to come.

JING KONG, TOMÁS PALACIOS, LEORA DRESSELHAUS-COOPER AND SHOSHI COOPER

Jing Kong and Tomás Palacios are in the Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology. Leora Dresselhaus-Cooper is Millie's granddaughter and is in the Department of Chemistry, Massachusetts Institute of Technology. Shoshi Cooper is Millie's granddaughter. e-mail: jingkong@mit.edu