



HOW ONE SCIENTIST CAN MAKE A DIFFERENCE

Millie Dresselhaus began life as the child of poor immigrants but went on to earn a PhD at the University of Chicago, become the first woman tenured full professor of engineering at MIT and, because of her scientific achievements, the first woman to win a National Medal of Science. She also held many administrative and advisory positions, supervised the graduate studies of more than 100 future scientists, and was an early and skillful advocate for women in science. She was an individual investigator, and her work was the essence of small science. But it was the originality and quantity of her research—more than 1700 research articles—that made her a much-honored legend.

The Breakthrough

Not just one, but rather hundreds of new insights and discoveries over 40 years that transformed understanding of carbon materials.

- Investigated how carbon atoms bond together, which led to understanding how to grow carbon fibers and to documenting their exceptional strength.
- Performed early studies of soccer ball-shaped carbon molecules so small they are often cited as the beginnings of nanoscience.
- Predicted the existence of carbon nanotubes, tiny but very strong structures now used in many industrial applications, and helped unravel the properties of sheets of carbon atoms one atom thick.
- Made significant contributions to improving thermoelectric materials that can directly convert thermal energy to electricity and vice-versa.

The Impact

- By working with 900 research collaborators, Dresselhaus built an interconnected network of scientists to advance carbon research.
- Carbon fibers are now used in space capsules, airplane wings, and other applications that need a high-strength but lightweight material.
- Carbon nanotubes are now used in solar cells, rechargeable batteries, and boat hulls, among other applications.
- Thermoelectric materials are used in a wide variety of niche cooling applications, from nuclear submarines to office water coolers, and to maintain stable temperatures for lasers and optical detectors.

The Takeaway

The creativity of individual scientists, funded as individual investigators, is still by far the most important source of advances in knowledge, and often leads to important new technologies.

ABOUT THE IMAGES

Dr. Millie Dresselhaus early in her career as an engineering professor at the Massachusetts Institute of Technology. (MIT)

In addition to her productive research career, Dresselhaus held many administrative positions and served on numerous advisory panels for the Department of Energy and other federal agencies. (DOE)

Dresselhaus was a devoted mentor for hundreds of students and junior colleagues throughout her career and was a notable advocate for women in science. Here with Luna Lu, now a professor of engineering at Purdue.

(LUNA LU)