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Chapter 1 : Remembering Mildred Dresselhaus - MIT Technology Review

Mildred Dresselhaus (nÃ©e Spiewak; November 11, - February 20,), known as the "queen of carbon science", was the first female Institute Professor and professor emerita of physics and electrical engineering at the Massachusetts Institute of Technology.

Find out how this Role Model continues to inspire others through her work in carbon science. By Amy Hyatt Fonseca Once upon a time, in a faraway land, there was a queenâ€"of carbon scienceâ€¦ In a previous post on Women in Nanotech , we talked about how Mildred Dresselhaus earned her royal title the hard way, through groundbreaking work in physics and engineering. But that was just the beginning of her story. With an interest in the electronic structure of semi-metals, especially graphite, Dresselhaus has dedicated more than 50 years to her work as a professor at MIT. Dresselhaus is an year-old mother, grandmother, and mentor who graduated over 60 Ph. And still, each morning she heads to her office at MIT ready to delve into her research and mentor students. All hail the queen! Last month, I had the opportunity to hear Dr. She spoke with enthusiasm about her drive for diversity and commitment to research. Eventually, she found her way to Hunter College where she took classes to become a teacher. Dresselhaus eventually landed at the University of Chicago where she took a quantum mechanics class from physics giant, Enrico Fermi. After receiving a Ph. In , the Dresselhauses had their first child and three more would eventually follow suit. This support led to a permanent position as a full professor of Electrical Engineering. She added a joint appointment in physics almost twenty years later. And we were right. In , she and Richard Smalley winner of the Nobel Prize in chemistry spoke at a Department of Defense workshop on carbon materials. This question led to a discussion on the single wall carbon nanotube. The topic continued to interest Dresselhaus and in , she published a paper with colleagues on the possibility of semiconducting or metallic carbon nanotubes. Instead, they lend a different and much-needed perspective to the world. We hope you learned something new about this Role Model. Let us know which quote inspires you.

Chapter 2 : Mildred Dresselhaus biography, married, husband, family, awards, google scholar, net worth

Mildred Dresselhaus, a professor emerita at the Massachusetts Institute of Technology whose research into the fundamental properties of carbon helped transform it into the superstar of modern.

Media can only be downloaded from the desktop version of this website. Share Leave a comment Mildred S. Dresselhaus, a solid-state physicist who was Institute Professor Emerita of Physics and Electrical Engineering and Computer Science, was also nationally known for her work to develop wider opportunities for women in science and engineering. She died at Mount Auburn Hospital in Cambridge, Massachusetts, following a brief period of poor health. She was the first solo recipient of a Kavli Prize and the first woman to win the National Medal of Science in Engineering. Bush, in , Dresselhaus was a member of the MIT faculty for 50 years. Her work on using quantum structures to improve thermoelectric energy conversion reignited this research field. She received a Carnegie Foundation grant in to support her efforts to encourage women to enter traditionally male dominated fields of science and engineering. For a number of years, she led an MIT seminar in engineering for first-year students; designed to build the confidence of female students, it always drew a large audience of both men and women. Just two weeks ago, General Electric released a second video featuring Dresselhaus that imagined a world where female scientists like her were celebrities, to both celebrate her achievements as well as to encourage more women to pursue careers in science, technology, engineering, and mathematics. Dresselhaus co-authored eight books and about 1, papers, and supervised more than 60 doctoral students. I was very fortunate to have had her as a mentor, and as an active member of the EECS faculty. She made such a huge impact on MIT, and her contributions will long be remembered. While she had planned to become a teacher, Rosalyn Yalow â€" who would go on to win the Nobel Prize in physiology or medicine â€" encouraged Dresselhaus to pursue physics instead. In , she joined what was then called the Department of Electrical Engineering as the Abby Rockefeller Mauze Visiting Professor, a chair reserved for appointments of distinguished female scholars. She became a permanent member of the electrical engineering faculty in , and added an appointment in the Department of Physics in In , Dresselhaus became the first female Institute Professor, an honor bestowed by the MIT faculty and administration for distinguished accomplishments in scholarship, education, service, and leadership. Scientific leadership and awards In addition to her teaching and research, Dresselhaus served in numerous scientific leadership roles, including as the director of the Office of Science at the U. Aside from her Medal of Freedom â€" the highest award bestowed by the U. Department of Energy for her leadership in condensed matter physics, in energy and science policy, in service to the scientific community, and in mentoring women in the sciences; and the prestigious Kavli Prize for her pioneering contributions to the study of phonons, electron-phonon interactions, and thermal transport in nanostructures. Active on campus Always an active and vibrant presence at MIT, Dresselhaus remained a notable influence on campus until her death. She continued to publish scientific papers on topics such as the development of 2-D sheets of thin electronic materials, and played a role in shaping MIT. Her remarks, on the importance of persistence, described her experience studying with Enrico Fermi. Three-quarters of the students in that program, she said, failed to pass rigorous exam requirements. Gifts in her memory may be made to MIT.

Chapter 3 : MIT Department of Physics

Widely known as the "Queen of Carbon," Mildred "Millie" Dresselhaus had an unparalleled career, making crucial advances in the understanding of the thermal and electrical properties of carbon nanomaterials during her nearly 60 years at the Massachusetts Institute of Technology.

Well-known for her scientific contributions, she is revered for her leadership in championing a more prominent role for women in the sciences - a position that has yielded significant strides during her career. Following her doctoral work at the University of Chicago, she focused her initial research on solid state physics and superconductivity. Currently an Institute Professor of Physics and Electrical Engineering, she has trained more than 60 graduate students. Dresselhaus is one of the foremost experts in the study of carbon science worldwide. Her investigations into the electronic properties of graphite, the structure and properties of novel forms of carbon, thermo-electricity and the new physics at the nanometer scale have significantly advanced these fields. She has lectured around the world, written extensively about her research and served in prominent leadership roles, including director of the office of science at the U. Department of Energy in the Clinton administration, president of the American Physical Society and the American Association for the Advancement of Science, among other high-profile posts. Among her numerous honors is the National Medal of Science, as well as 20 honorary degrees from various colleges and universities. The mother of four, Dr. Dresselhaus faced unique challenges in the workplace, which perhaps provided the inspiration to assist other women to pursue scientific careers. In she became the Abby Rockefeller Mauze chair, endowed in support of the scholarship of women in science and engineering. Dresselhaus arrived at MIT in , women comprised just 4 percent of the undergraduate student population; the percentage of women today tops 40 percent. A researcher who unlocked scientific mysteries and opened the door of opportunity for countless women, Dr. Mildred Dresselhaus is as respected as she is beloved. She has served as a mentor and role model to many young scientists, and through this legacy, her contributions to science will endure for many generations to come. Cited for "leadership and contributions across many fields of science and engineering, she is also the first woman to earn the prestigious award. The materials scientist from the Massachusetts Institute of Technology was awarded for her work in revealing the strange thermal and electrical properties that carbon develops at the atomic scale. Materials and Society Award is Dr. Mildred Dresselhaus of MIT. The Acta Materialia, Inc. Award in Materials and Society was established in memory of Dr. Herbert Hollomon and his dedication to promoting positive social consequences of science and technology that have had a major impact on society. The Award consists of a Steuben glass sculpture, an inscribed certificate, and a cash honorarium. NSB members agreed that Dresselhaus is especially deserving of the Vannevar Bush Award for her outstanding contributions to both her scientific field and to the scientific community at large. The award is the highest honor bestowed by the school, and it goes to Dresselhaus for her "pioneering contributions and leadership in the field of carbon-based nanostructures and nanotechnology, and for promoting opportunities for women in science and engineering. Yes, I knew about this award, but I never dreamt it was of my possibility. My own contributions, as were explained, were in science. Yes, science and technology are closely related and we need much more of it as we go into the future. We certainly have a lot of work to do before us. And, I thank you very much for this opportunity for the recognition and the opportunity to serve more in the future.

Chapter 4 : Mildred S. Dresselhaus | The Franklin Institute

Mildred Dresselhaus biography, married, husband, family, awards, google scholar, net worth | Mildred is a famous American physicist. She had also been a teacher at various institutes like MIT and she has contributed immensely in the field of carbon nanotubes.

Mildred Dresselhaus was born and grew up in New York City. She received her PhD degree at the University of Chicago in Her research has covered a wide range of problems in the physics of solids with special attention to nanoscience. The following interview of Prof. How does that differ from a regular professorship? Obviously we have MIT values and needs that are utmost on our radar screen, but I think Institute Professors are given a message that we should try to do unique things. And what happened to me personally that gave me even more emphasis to go into unique things recently was the Heinz Award that I got last year. Yet the work that I do is science-oriented but with an impact on technology. My award was in two other areas as well, areas you would think I have no impact on at all. One of them is economics and the other one is employment. So your work is really quite interdisciplinary in nature. And then I have electrical applications. I do like seeing the differences in the workings of these departments. I think that all these new types of research sponsors that we have now are the trend of the times. And even foreign countries are putting in money for the work that we do here. And they may have their own interests in mind, not necessarily the interest of our students. Back to top FNL: Earlier you mentioned your work with women in science. How do you think that has changed over time? And for the graduate students it was less than that. So you can imagine that you saw very few women in the daily classroom. And we had almost no women faculty. We were less than 10, I think, when we started. We were really a minority. What was so important for the students that I met was that during their classroom time or in their research groups they never saw another woman. Most of the classes that I taught were comprised of all men. And if we had a woman student, she would be isolated in the classroom with empty seats around her. And so the women felt isolated from the other students in the class, and the professors were not comfortable and familiar with them either. So I used to have mentoring sessions in my office and discuss what do you do when this or that happens. And I was working hard to get networking for them to meet each other across departments, across different areas of research. At the time of the study I personally had thought we had overcome most of the earlier barriers. But when we sat down around the table before that committee ever was formed â€” and these women at the table were tenured women faculty with quite a bit of impact on their professions both inside and outside of MIT â€” people were saying how our lives were not equivalent, that our experience here was just second class to male faculty in some ways. And then the report showed that our impressions had some basis. The outcome was different than I expected. I thought we had gotten further in reaching equality than what the data showed. And the administration stepped up to the plate, I thought, to give us more equal status. Why do you think you were so surprised by the results of the Women in Science report? For those of us who had been here for a long time, we just saw the changing scene and we thought that we had reached a very comfortable level, primarily because the academic performance of women students was equal to men in every department, and the probability for women faculty to get tenure was equal. What came back to us was that women faculty were not getting the information from their departments that they got when we got together in the s and s and talked â€” information about what the tenure process was and what was important, how to get grants, and those kinds of issues. And how would you assess the situation now? Well, I think that what happened is that the Nancy Hopkins report and what the Institute has done in response to the report has just had a huge impact, because I think women students and faculty are much more respected now as equal members of the establishment here. She keeps sending us our own faculty email. And she seems very open. When she was starting out she interviewed quite a few of us â€” I was one of them â€” and we spent a lot of time together talking about MIT. She was trying very hard to learn our culture. I was a little surprised, actually, that we would have a woman president while I was still here, because when I came to MIT we were so far from ever thinking about a woman president or even a woman dean. And now we have women department heads and many on Academic Council. And Susan Hockfield is committed to promoting all

students. I know she takes an interest in women students, but not only women students. I understand that you are in your office 5: Oh, maybe more like 5: My schedule is a little bit unusual for an MIT professor. And if you have a musical commitment at night you have to leave the lab around 5: And then I also have to get some work done, and after 9: So I have to add some time, like three hours before 9: I think that the students from other countries, at least to some degree, are in some ways discouraged from coming here. At the same time there are also more opportunities in other places than before. And it used to be that the U. And there are funds for doing it; there are many incentives offered. Now we have even some discouragement, but still students from abroad like to come here and seem to do well once they are here. There are, however, factors that are working against the U. Our funding situation, at least in my field, has not been very attractive. And it discourages people from going into the field because they see how we struggle to make ends meet. And what are you working on right now? I like doing a certain amount of these various service kinds of things. But when something comes along and I think I might have a special knack for it. And here is another place where the women faculty look at things differently. Well, thank you very much.

Chapter 5 : Millie Dresselhaus Fund for Science & Society

Mildred Dresselhaus was born Mildred Spiewak in the Bronx, New York on 11 November Raised in an impoverished household, she overcame the odds and received a high quality education, becoming a pioneer in the field of solid-state electronics.

Bridget Cunningham March 7, Mildred Dresselhaus has been an influential figure in science and engineering for many years. She is recognized as a driving force behind innovative research in the field of carbon science, among other areas, and an influential supporter of female leadership and development in physics and other traditionally male-dominated fields. While growing up in the Bronx, New York City, Dresselhaus took an interest in playing the violin, encouraged by her musically gifted older brother, and imagined herself one day becoming a schoolteacher. Digging deeper into her education, she recognized the ease with which the subjects of math and science came to her. This realization prompted her to pursue an undergraduate degree in physics at Hunter College in New York. Image by Donna Coveney. During her fellowship at the University of Cambridge, she took advantage of the opportunity to sit in on open lectures, listening carefully to everything that she heard. Among these lecturers was the famous British physicist Brian Pippard, known for demonstrating the reality of Fermi surfaces and conceptualizing coherence length in superconductors. As Dresselhaus began to learn more from these lectures, her interest in science and engineering continued to flourish. Her time at the University of Chicago, where she earned her PhD in physics in , solidified this passion. The university, which was considered the mecca of physics in the U. Recently, I was fortunate enough to speak with Dresselhaus and hear more about her experience. Empowering Women in STEM As a student, in her undergraduate, graduate, and postgraduate studies, Dresselhaus often found that she was quite isolated in her science classes. In fact, she was many times the only woman in her class. That caused her to ask the question: Her career at the university first began with a research position at Lincoln Laboratory. From there, she moved on to become a visiting professor of electrical engineering, a tenured faculty member, and eventually, in , a professor of physics. Throughout this time, Dresselhaus was praised for her dedication to empowering women to pursue careers in fields typically dominated by men, such as physics. In an effort to provide financial support and to encourage this outreach activity, a Carnegie Foundation grant was given to Dresselhaus in Abby Aldrich Rockefeller, the only daughter of John D. Along with fostering support for women to attend the university, offering female students mentoring and guidance throughout their studies has also been a point of focus for Dresselhaus. In the Friday afternoon sessions she held each semester, for instance, students had the opportunity to join her for open discussions, where topics ranged from material covered in the classroom to career advice. The awards and honors that Dresselhaus has received over the years speak to her profound impact on generating a stronger presence of women in physics and other STEM fields. The award recognizes the contributions of female researchers to scientific progress in an effort to foster female professional development. Dresselhaus was given the honor in for her research on solid-state materials, including conceptualizing the creation of carbon nanotubes. More recently, in , she received the ACS Award for Encouraging Women into Careers in the Chemical Sciences, an award that celebrates the accomplishments of women who have shown support for females taking on roles in chemistry, from chemists to chemical engineers. The impact of Dresselhaus on her students has been powerful both inside and outside of the classroom. Another arena in which her contributions have also shined over the years is within the research laboratory. From Carbon Nanotubes to Graphene: Years of Innovative Research Every day in the field of science is an exciting day for Dresselhaus. Think back to 50 years ago, when carbon science was not the popular topic that it is in scientific research today. For Dresselhaus, the popularity of the subject was never a concern: Her initial research in the nanoscale properties of carbon materials established a foundation for later discoveries in regards to carbon nanotubes, buckyballs, and graphene. Recently, for instance, Dresselhaus was part of a team at MIT that identified a simple and scalable approach for producing large 2D sheets of graphene and other materials â€” a challenging limitation over the years. Discovering new dimensionality for individual materials, as in the above example, has provided answers to scientific mysteries, while laying the groundwork

for extending the applications of such materials. These awards include the Enrico Fermi Award, an honor celebrating the achievements of scientists for energy creation, use, and production. She was also awarded the IEEE Medal of Honor, making her the first woman to receive the award in its year history. This award is designed to recognize leadership and contributions across various fields of science and engineering. Among the other honors she has received are the Kavli Prize, which recognizes scientific contributions in the fields of nanoscience, neuroscience, and astrophysics, as well as the Presidential Medal of Freedom. As a professor, Dresselhaus looks to impart her vast knowledge and experience onto her own students. Enrich the next level of scientists and engineers to encourage continued growth and innovation in research. We were fortunate to speak with Mildred Dresselhaus in Since we originally published this blog post, Dresselhaus has passed away February 20,

Chapter 6 : GEâ€™s â€˜woman scientistâ€™ ad is just plain creepy

Mildred "Millie" Dresselhaus Brought up in a poor suburb of the Bronx, the young Millie Dresselhaus went to some of the worst schools in New York City. "Things weren't looking to well for me, I was born in the depression - we were one of the many families on welfare".

Raised in an impoverished household, she overcame the odds and received a high quality education, becoming a pioneer in the field of solid-state electronics. As a student Dresselhaus showed a keen interest in mathematics and music. She attended Hunter College in New York under a state scholarship, and continued her mathematics education. Finding great enjoyment in science, she earned her degree in it with high honors in She continued her studies at the graduate level in Cambridge, England for a year under a Fulbright scholarship before returning to the U. It was during her graduate school years in Chicago that she began to study superconductors , a subject that became the focus of her doctoral thesis. It also brought her into contact with her future husband, Gene Dresselhaus, another researcher in the solid-state area. Two years after her graduation and marriage in , Gene and Mildred Dresselhaus were both offered faculty positions at MIT. Her research led to advances in carbon-based materials used in solid-state electronics. In part because of the high quality of her research and teaching at MIT, she was promoted to Professor in In the late s she made important contributions to understanding the structure of graphite intercalation compounds. The work of her group on fullerenes and carbon nanotubes began in the early s before these structures were well known. She also demonstrated the symmetry of single-wall nanotubes and how one could calculate their electronic structure. Her work on nanotubes continues today, including the important contribution of the measurement of Raman spectroscopy on isolated single-wall carbon nanotubes. Her recent work on the semiconductive properties of carbon nanotubes opens new possibilities in nanotechnology, and other recent research holds exciting promise for energy-related applications. Recognizing this as an issue of great importance for the profession, Dr. Her unquestioned accomplishments in the laboratory and classroom gave her an unparalleled credibility in this national dialogue. The article also stressed the critical importance of role models for women engineering students, which Dr. Dresselhaus herself has certainly served as through mentoring, formally and informally, countless young women across the United States and around the world. Dresselhaus still teaches at MIT.

Chapter 7 : Mildred S. Dresselhaus | theinnatdunvilla.com

Mildred "Millie" Dresselhaus, a celebrated and beloved scientist and MIT professor whose research helped unlock the mysteries of carbon, has died at A recipient of the Presidential Medal of Freedom and National Medal of Science, the "queen of carbon science" led the U.S. scientific community and was a champion of women in science and engineering.

Well, I retired when I was 75 years old. So I taught over 50 years - 55 years. I was there for a long time. It was recorded that you were awarded the National Medal of Science in for your work on electric properties of materials as well as expanding opportunities for women in physics and engineering. How exactly were you expanding opportunities for women at this time? Well that was just a side project. The growth of the number of women students was very dramatic but what they were studying was different from what the men were studying. The majors they selected were different. So they were heavily into biology and things related to that, even chemistry. Not physics and not engineering. What do you think led to such a huge growth in the amount of women? Well, I think that were two things. I think that the administration promoted it, but I think that the women who were there worked hard with the administration to support growth, and we had programs to help the young women who were appointed so that they would be successful. What we discovered in the early years when they were appointed was that for the most part they were unsuccessful. That required or seemed to indicate that there was a cultural factor that had to be taken care of. Well, by analyzing what keeps women away from these fields of science and showing them that they can do it too and helping them along, showing them the paths that work better than others. It has something to do with women working in a male culture. The chemists decided to give me that award. Sure, in fact my work relates to chemistry because I do spectroscopy and chemists do a lot of spectroscopy, so there is some connection there. So throughout your career, what professional organizations have you been a member of, or are a member of now? It is sort of the preeminent physical society worldwide. If you want to be in physics, you join the American Physical Society no matter where you live because historically they run good meetings, organize the journals that everybody publishes in. What happened basically, historically, is that WWII decimated a large part of the world and it took years before the Europeans really got their act together. After WWII, it took a long time for science to recover. Europe had been the seed of science when I started studying science. We never had war locally during my lifetime. So science flourished because it was a peaceful place to work and the government put money into it. The US had the environment that was necessary for science to flourish. So what would you say you have gained from being a member of the American Physical Society? A lot of connections to people? Well I was President of the society in That was a very long time ago, right? I thought running and losing is a good thing - not a bad thing. That turned out to be pretty interesting and I turned out to be pretty good at it. So one thing led to another, so I was president of several organizations. Which organizations have you been president of? Look at my C. I was president of AAAS; that was a big one. I was president of various things. I did that job too. I did various things - most of the main ones that are around. So what issues have you experienced in STEM fields because of your gender. How have you overcome those issues? I would say in physics the issues are that there are very few of us. The positive thing is that the women support each other very strongly in physics. We tend to know each other because we are very few in number. People are nice to each other and give each other tips on things happening. The other part is that there are always challenges. In any kind of position you have within an organization there is work to be done. Leadership is expected and we are supposed to do good things for the profession and to figure out how to make that all happen at minimum cost and overhead, so to speak. You will always have some kind of administrative support that comes through the organization of people who are permanently employed in administrative jobs. I found those people helpful. Part of the leadership came through our national academies in the US which do a lot of work in providing studies for the government on any topic the government is interested in knowing something about. I was elected back in to the National Academy of Engineering. I was elected to the National Academy of Sciences in , which is also a pretty long time ago. I had various jobs. I was on the council; I was an officer in the academy. I was lots of things, studies, whatnot. So I got to know people in government and they got to know me. They liked that we are active in

those kinds of national leadership activities. What happened was when I was working for the government, I was head of the Office of Science of the Department of Energy in the Clinton administration. When you do something like that you have to disrobe yourself. Let somebody else do them. What research are you working on now? Pretty much similar things to what I have been doing for a long time. When I started in , nobody was interested in that field. I give many, many talks on this topic worldwide. The other thing that has happened is people are interested in energy and energy security. Those are my two research areas. I even put them together to some degree. Did you feel there was additional pressure to balance that professional life with your personal and family life? Well, once you get into it, you just do it. I had a formula. I had a babysitter whom I hired. But, you know, with children after 20 years they leave home, right? So then you go on. So my child-rearing time is a long time ago. My children are in their fifties. Do you have any advice for a woman who is in a demanding career such as yours, or such as anything in STEM fields, and wants to start or maintain a family life? You have to figure out a formula that works for you. Everybody has a different formula. There is no way to say that this is the right formula because there is no right formula. If you decide that you want to do it, you do it. You figure out a way that works for you. It always means that you have to cover your bases. When the children are small you have to have somebody there to help you with taking care of them and making sure that they are well-cared for one way or another. That is what the special thing is. You figure out a way to get your kids a good background and take care of their needs and each of them separately and differently. I would say it depends on where you are. I think women benefit from being in places and having positions where the quality of work is the criteria, not what you look like. Not every place is like that. I would say that is one factor. Do you think it is largely academic environments that are more accepting towards women and more of a meritocracy? I think there are people who work in industry that say that industry is much easier than academia for women. It depends on the particular situation I think more than necessarily the place. Once there have been a number of people who have proven some kind of existence theorem and there is a pathway identified and shown how to overcome any obstacles because of gender, then we have it made. I think people like you know that better than I do. So in this way it is getting better. There are more of us.

Chapter 8 : Mildred "Millie" Dresselhaus

Mildred Dresselhaus has proved herself to be a triple-threat since her entrance into the world of science. While being a physicist who has studied within the fields of material science and electrical engineering, she is most popular for her dedicated promotions for women within all science and engineering fields as well as for her own [ ].

Benjamin Franklin Medal Citation: For her fundamental contributions to the understanding and exploitation of carbon nanomaterials, such as the spheres known as buckminsterfullerenes, the cylindrical pipes called nanotubes, and the single-atom-thick sheets of carbon known as graphene, and for launching the field of low-dimensional thermoelectricity, the direct conversion of heat to electricity. Dresselhaus passed away on February 20, , at age Dresselhaus was born in , during the Great Depression, in the Bronx. Her parents had immigrated to New York from Poland. The family was poor, but Dresselhaus and her brother possessed rare musical talent. The divide motivated her, at age 13, to apply for a spot at the competitive Hunter College High School for Girls. It was there that she met Roslyn Yalow, a physics teacher and future Nobel laureate, who encouraged her to consider a career in science. Dresselhaus graduated from Hunter in and accepted a Fulbright Fellowship at the University of Cambridge in England. Though Fermi would pass away soon after, he would remain a powerful influence on Dresselhaus throughout her career. In Dresselhaus joined the Lincoln Lab at MIT, where she diverged from her graduate study on semiconductors and turned her attention to the properties of graphite. Her research success led to an appointment as a visiting faculty member in the Electrical Engineering Department at MIT under the Abby Mauze Rockefeller Fund, established to promote the scholarship of women in science and engineering. Throughout the s, Dresselhaus built her scientific reputation with her study of graphene intercalation compounds. Graphene is composed of sheets of carbon atoms connected in a hexagonal structure. Intercalation compounds introduce elements between the carbon layers, inducing unique electrical properties like superconductivity. Her extensive research of these materials resulted in a better understanding of fundamental quantum concepts which Dresselhaus used to update theoretical equations as they apply to nonmaterial systems. The ablation produced large carbon clusters of 60 or 70 atoms. Richard Smalley, who was independently performing similar experiments, identified the clusters as fullerenes, more commonly called buckyballs. Dresselhaus spent the remainder of her career calculating the intricacies of carbon nanotubes, which she determined could be formed by elongating the fullerene structure instead of terminating it into a buckyball. She showed that the electrical properties of the carbon nanotubes changed with the orientation of the hexagonal structure. Her calculations of these electrical properties revealed that carbon nanotubes could be applied as either metals or semiconductors. As a female researcher in the physical sciences, Dresselhaus was a trailblazer, inspiring innumerable girls and women to follow in her footsteps. In addition to being the first woman at MIT to achieve the rank of tenured professor, in she became the first woman to receive the National Medal of Science in engineering. She has also served in many important leadership roles, including president of the American Physical Society and of the American Association for the Advancement of Science and director of the U. Department of Energy Office of Science. Dresselhaus remains a powerful figure with tremendous impact spanning physics, engineering, and materials science. Perhaps her most powerful contributions extend far beyond her technical achievements. She will also be remembered for her role in training and inspiring generations of scientists and engineers of many disciplines who keep her legacy alive through their own work. Dresselhaus passed away on February 20, Her medal will be awarded posthumously. Information as of April 1, Twitter Could wind farms help slow down hurricanes before they make landfall?

Chapter 9 : Mildred Dresselhaus - Wikipedia

Dresselhaus was a native of New York City. She attended Hunter College, the University of Cambridge on a Fulbright Fellowship, and Harvard University, and received her Ph.D. from the University of Chicago in

Director, Center for Materials Science and Engineering â€" American Physical Society, President â€" National Academy of Sciences, Member National Medal of Science Nicholson Medal, American Physical Society Vannevar Bush Award Kavli Prize in Nanoscience Presidential Medal of Freedom IEEE Medal of Honor Research Interests Recent research activities in the Dresselhaus group that have attracted wide attention are in the areas of carbon nanotubes, bismuth nanowires and low dimensional thermoelectricty. Regarding carbon nanotubes, which were previously predicted to be either semiconducting or metallic depending on their geometries, we have been developing the method of Raman spectroscopy as a sensitive tool for the characterization of single wall carbon nanotubes, one atomic layer in wall thickness. This work started in earnest with the initial observation with Rao et al. Next we showed characteristic differences between the Raman profile of the G-band depending on whether the nanotubes were metallic or semiconducting. This work eventually led to the observation of Raman spectra from one single nanotube, with intensities under good resonance conditions comparable to that from the silicon substrate, even though the ratio of carbon to silicon atoms in the light beam was approximately only one carbon atom to one hundred million silicon atoms. However, at the single nanotube level, the characteristics of each feature can be studied in detail, including its dependence on diameter, chirality, laser excitation energy and closeness to resonance with electronic transitions. Of particular importance is the uniqueness of the electronic transition energies for each nanotube, which are described in terms of two integers n, m which uniquely specify the geometrical structure of the nanotube, including its diameter and chirality. The high sensitivity of the Raman spectra to diameter and chirality, particularly for the characteristics of the radial breathing mode, which are also uniquely related to the same n, m indices, thereby providing a structural determination of n, m at the single nanotube level. The n, m assignments made to individual carbon nanotubes are corroborated by measuring the characteristics of other features in the Raman spectra that are sensitive to nanotube diameter and chirality. Raman spectroscopy potentially provides a convenient way to characterize nanotubes for their n, m indices, in a manner that is compatible with the measurement of other nanotube properties, such as transport, mechanical and electronic properties at the single nanotube level, and the dependence of these properties on nanotube diameter and chirality. We previously predicted a semimetal-semiconductor transition in bismuth nanowires as a function of nanowire diameter due to quantum confinement effects, and we have now succeeded in observing this effect through transport measurements. We are now studying the transport and optical properties of the nanowire arrays with particular relevance to enhancing their thermoelectric properties. For scientific studies we are developing techniques to make measurements of the resistance of single quantum wires as a function of nanowire diameter using a 4-probe method. The doping of bismuth with antimony, which is isoelectronic to bismuth, is of special interest for achieving an enhancement in thermoelectric performance, especially for p-type legs in thermoelectric devices. For this reason we are now studying the structure, electronic and transport properties of bismuth-antimony nanowires as a function of nanowire diameter and antimony concentration. 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 semi-metals, especially graphite. In , she was appointed to The Abby Rockefeller Mauze chair, an Institute-wide chair, endowed in support of the scholarship of women in science and engineering. Professor Dresselhaus has greatly enjoyed her career in science. On her experience working with MIT students, she says, "I like to be challenged. I welcome the hard questions and having to come up with good explanations on the spot. Dresselhaus, Structural n,m determination of isolated single wall carbon nanotubes by resonant Raman scattering, Phys. Pimenta, Joint density of electronic states for one isolated single wall carbon nanotube studied by resonant Raman scattering, Phys. B 63, B 63, R Souza Filho, and R.