Prof. Douglas Osheroff

American Physicist and a 1996 Nobel Laureate

Prof. Douglas Dean Osheroff (born 1st August 1945) is an American physicist who shared the 1996 Nobel Prize in Physics with Prof. David Lee and Prof. Robert C. Richardson for their discovery of superfluidity in helium-3. He received a PhD from Cornell University in 1973. He then worked at Bell Labs in Murray Hill, New Jersey for 15 years, continuing to research low-temperature phenomena in helium-3. In 1987 he moved to the Departments of Physics and Applied Physics at Stanford University, where he also served as department chair from 1993-96. His research is focused on phenomena that occur at extremely low temperatures. He currently serves on the board of advisors of Scientists and Engineers for America, an organization to promote science in American government.

How Advances in Science are made

12th February 2010

The talk started with a profound question, "By their very nature, those discoveries that most change the way we think about nature cannot be anticipated. How, then, are such discoveries made, and are there research strategies which can increase the probability of making such a discovery?" Like a seasoned storyteller, Prof. Osheroff then narrated the history of his attempt to answer this question which led to the discovery of superfluidity in He-3.

He told the audience how he, in the beginning of his graduate years, modified a Pomeranchuk cell which when coupled with He-4 - He-3 dilution refrigerators, gave good conditions for very low temperature experiments. During his fifth year, while working on a problem two other graduate students made him give up the laboratory's only NMR magnet that he had monopolized for three months. He later realized that they had actually forced him to stop an experiment that was completely hopeless. Then, driven by curiosity he started taking observations for the cooling rate of He-3 in a temperature range which at that time was unexplored and soon observed a kink in the cooling rate. His was the first reported observation of phase transition to the superfluid phase in He-3.

He summed up the strategies that worked for him while pursuing his research:

- Utilize new technologies
- View nature from a new perspective or in a different realm
- Don't give up when things are going badly
- Failure may be an invitation to try something new therefore keep walking.
- Spend a little time doing something different
- Curiosity driven research can be very rewarding!
- Avoid too many commitments
- The demands of good research do not adhere to a schedule
- Back off from what you are doing occasionally to gain a better perspective on the task at hand
- We become myopic when we focus too tightly on our work. It was only after he tried to look for the big picture that he discovered 1-Dimensional MRI.

Similar tales of the triumph of man in understanding nature in the field of experimental science were mentioned in the talk. They included that of Heike Kamerlingh Onnes who pioneered refrigeration techniques and explored how materials behaved when cooled to nearly absolute zero and that of Penzias and Wilson who while using the Horn Antenna at Bell labs stumbled on the microwave background radiation that permeates the universe. The strategies used in the abovementioned researches echoed Prof. Osheroff's belief about how one can increase the probability of making path breaking discoveries.

Prof. Osheroff's own words provide a most fitting conclusion:

"Advances in science are seldom made by individuals alone. They result from the progress of the scientific community, asking questions, developing new technologies to answer those questions, and sharing their results and their ideas with others. To have rapid progress, one must support scientific research broadly, and encourage scientists to interact with one another and to spend some of their time satisfying their own curiosities. This is How Advances in Science Are Made".