

# 19th S. N. Bose Memorial Lecture

23<sup>rd</sup> January 2009 at 3.30 p.m.

Venue

Vivekananda Hall

Ramkrishna Mission Institute of Culture

Golpark, Kolkata 700 029



**S N Bose National Centre  
for Basic Sciences**

Kolkata

## Abstract

**W**hy do physicists freeze matter to extremely low temperatures? Why is it worthwhile to cool to temperatures which are more than a million times lower than that of interstellar space? This lecture will discuss new forms of matter, which only exist at extremely low temperatures. Low temperatures open a new door to the quantum world where particles behave as waves and march in lock step. In 1925, Einstein predicted such a new form of matter, the Bose-Einstein condensate, but it was realized only in 1995 in laboratories at Boulder and at MIT. More recently, Bose-Einstein condensates of molecules and fermion pairs have been created and may show behavior similar to electrons in superconducting materials. A new form of high-temperature superfluidity has been discovered. In the future, we hope to use ultra cold gases to create designer matter, i.e. to realize new forms of matter in the laboratory which have been discussed as model systems for many-body phenomena, but have not been observed in nature.

*Speaker*

**Wolfgang Ketterle**

Nobel Laureate  
John D MacArthur Professor of Physics,  
Massachusetts Institute of Technology, Cambridge, USA

About the Speaker



**Wolfgang Ketterle** was born in Germany in 1957. In childhood he showed an all round excellence in school and was deeply interested in experiments in physics and chemistry. For his Ph.D which he obtained from the Max Planck Institute at Garching, he discovered the existence of Helium hydride using laser spectroscopy. After graduation he decided to pursue applied research in an university setting - the University of Heidelberg. The topic was cleaner and more efficient combustion. But the desire for exploring fundamental physics caused him to switch tracks again at the age of 32. He moved to MIT in the United States in 1990 and started working on cold atoms. In 1995 he successfully demonstrated the existence of Bose Einstein Condensation in Ultracold Sodium atoms. This fetched him the Nobel Prize in 2001. Since then he has been involved in pathbreaking work with ultracold fermions.

The Satyendra Nath Bose National Centre for Basic Sciences, Kolkata organizes the S N Bose Memorial Lectures as a tribute to the Late National Professor Satyendra Nath Bose

**When Freezing Cold is not  
Cold Enough-New Forms  
of Matter Close to  
Absolute Zero Temperature**

