

## S. N. BOSE MEMORIAL LECTURE



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

### 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.

### Past Speakers



Leon Van Hove	1988	C N R Rao	1999
B M Udgaonkar	1990	R A Mashelkar	2000
H E Stanley	1991	Albert Libchaber	2001
C H Llewellyn Smith	1992	Jayant V Narlikar	2002
E C G Sudarshan	1994	Martin Blume	2003
V Singh	1995	S. R. S. Varadhan	2004
B V Sreekantan	1996	Abhay Ashtekar	2005
Kazuo Fujikawa	1996	Rashid A Sunyaev	2007
Sir Sam F Edwards	1996	Ashoke Sen	2008

19th

## S. N. Bose Memorial Lecture

on

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

by

**Wolfgang Ketterle**

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

on

**23 January 2009**

at

Vivekananda Hall  
Ramkrishna Mission Institute of Culture  
Golpark  
Kolkata 700 029



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

Kolkata

### Abstract



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

**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.

### S N Bose National Centre for Basic Sciences

Block JD, Sector III, Salt Lake,  
Kolkata 700 098



*O*n behalf of the Centre

I have great pleasure in inviting you

to the

**19th S N Bose Memorial Lecture**

at 3.30 pm on Friday

the 23rd January 2009

at the

Vivekananda Hall

Ramkrishna Mission Institute of Culture

Golpark

Kolkata 700 029

**Arup K Raychaudhuri**  
Director