



INDIAN INSTITUTE OF TECHNOLOGY MANDI

भारतीय प्रौद्योगिकी संस्थान मंडी

# Institute Colloquium

“200 years of studies of phase transitions”



30<sup>th</sup> January,  
2026



05:00 PM



Auditorium,  
North Campus

**Prof. Deepak Dhar**

**I.N.S.A. Distinguished Professor,  
International Center for  
Theoretical Sciences,  
Tata Institute of Fundamental  
Research, Bengaluru**

## **200 Years of Studies of Phase Transitions**

Prof. Deepak Dhar (Honoured with the Padma Bhushan, India's third-highest civilian award in 2023)

**Affiliation:** - I.N.S.A. Distinguished Professor, International Centre for Theoretical Sciences, Tata Institute of Fundamental Research, Bengaluru, India.

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### **Abstract:**

The scientific study of phase transitions may be said to have begun with the demonstration of continuity of the liquid and gaseous states at high temperatures by Cagniard de la Tour in 1822. In this lecture, I will present a personal perspective about its status after 200 years. Our understanding of continuous phase transitions is pretty good by now. The scaling theories of Widom, Fisher and Kadanoff have led to a good framework for understanding critical phenomena.

But we still do not have simple tractable models that show the solid to liquid to gas phase transitions. First order transitions, and other transitions like the glass transition are still not understood as well. I will try to explain the basic ideas of the Lee-Yang theory of phase transitions in terms of the zeros of the partition function in the complex activity plane, the work of Wilson on the renormalization group theory for continuous phase transitions, and phases that are intermediate between solid and liquids. I will also mention some of my recent work on phase transitions in systems with only hard-core interactions.

### **Bio-Sketch:**

Academic Qualifications:

Bachelor of Science from University of Allahabad, Allahabad in 1970

Master of Science (Physics) from Indian Institute of Technology, Kanpur in 1972

Ph. D. in Physics from California Inst. of Tech., Pasadena in 1978

### **Employment History:**

He joined the Department of Theoretical Physics, Tata Institute of Fundamental Research, (Mumbai) in 1978 as a Visiting Fellow, and retired as Distinguished Professor in 2016. During Nov. 2016 -Apr, 2024, as was in the Physics department at I.I.S.E.R. as a Distinguished Emeritus Professor. I was supported by the Senior Scientist Fellowship of NASI Jan. 2022-Jan. 2023. Since Apr. 2024, I am at I.C.T.S., Bengaluru as an I.N.S.A. Distinguished Professor.

### **Honours and Awards:**

E. P. Anthony Fellow 1972-73, R. P. Feynman Fellow 1974-76. I.N.S.A. Young Scientist Award 1983. S. S. Bhatnagar award in Physical Sciences 1991.

J.R. Schrieffer Prize in Condensed Matter Physics 1993.

Fellow of the Indian National Science Academy, New Delhi; National Acad. of Sciences, Allahabad; Indian Acad. of Sciences, Bangalore;

The World Academy of Sciences, Trieste.

S. N. Bose medal of I.N.S.A. (2001).

Third World Academy of Science Prize in Physics (2002).

J. C. Bose Fellowship of Dept. Sci. Tech. (India) (2007-2017).

Boltzmann medal of IUPAP (2022).

Honorary Fellow of T.I.F.R. (2022).

Distinguished Alumnus Award of I.I.T.K., 2022.

R. D. Birla Memorial award of the Indian Physics Association, 2022.

Padma Bhushan award by Government of India, 2023.

Meghnad Saha Centenary Medal by the University of Allahabad, 2023.

Ph.D. Honoris Causa by the University of Allahabad, 2023.

Champions of Change award Maharashtra, by the Interactive Forum on Indian Economy (2023),

Honorary member of Physical Society of Uzbekistan.

### **Organizational Activities:**

Advisory Editor, Physica A (till 2004); Member of Editorial Boards of J. of Stat. Phys. (1993-6,99-02, 05-); J. Stat. Mech., Phys. Rev. E (2008-13), Pramana (2008-14); J. Phys. A (2010-16); Annals of Physics (2023), Member, IUPAP Commission on Statistical Physics (1992-95); Dean of Graduate Studies at TIFR (2010-14); Member, Council of Indian Academy of Sciences, Bengaluru (2015-2018). Organized 5 Refresher courses for college teachers in Physics under the Science Education Panel of the Academies of Sciences. Convener of the CSIR-UGC NET examination in Physics (2016-2019). Member, Sectional Committee of INSA for Physical Sciences (2020-22).

### **Supervision of Theses:**

At T.I.F.R., 14 students completed their Ph. D. under my supervision.

At I.I.S.E.R. Pune, I supervised the M.S. theses of 6 students.