

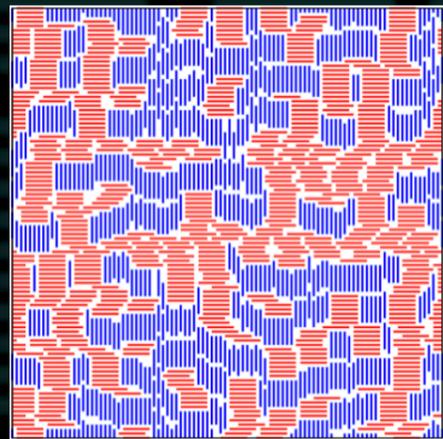
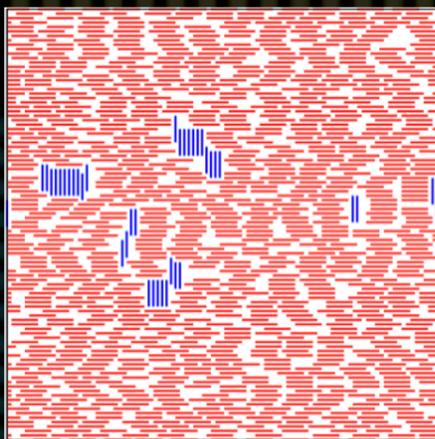
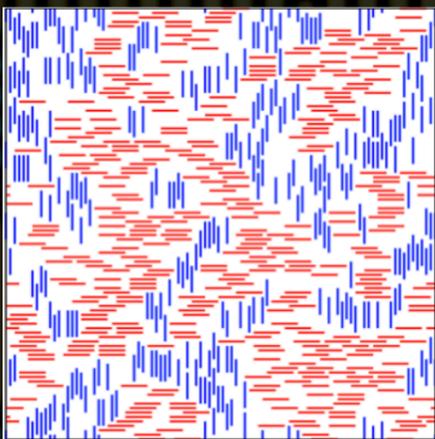
Phase transitions in a lattice model of long rods with only hard core interactions

15th Madan Lal Mehta Lecture by

Professor Deepak Dhar
IISER-Pune

Monday, April 11, 2022 at 2:30 pm

Venue - AG66 Live Webcast - <https://youtu.be/sDXq6120AI8>



I will discuss the phase transitions in a system of straight rigid rods of length k on a d -dimensional hyper-cubical lattice. This problem is a lattice version of the problem studied by Onsager in continuum, where he showed that this system undergoes an entropy-driven phase transition, where the distribution of orientations of a rod in a large box is uniform, for low density of rods, but the rods develop long range orientational order at densities higher than a critical density.

In the lattice problem, there is a second phase transition at higher densities, and the orientational order is again lost at densities near the full packing limit. I will discuss my recent work with R. Rajesh and A. Shah, which leads us to conclude that the second phase transition is a first order transition, and conjecture exact asymptotic values of the chemical potential and the coexistence densities in the limit of large k . Interestingly, these asymptotic values are independent of the dimension of the lattice.



Deepak Dhar was born on October 30, 1951 at Pratapgarh, Uttar Pradesh. After finishing his Ph.D. at Caltech in 1978, he returned to India, and joined TIFR, Mumbai as a regular faculty member where he was a Distinguished Professor at the time of his superannuation in September 2016. He is currently a NASI-Senior Scientist and a Distinguished Emeritus Professor at IISER Pune. Dhar is known for his work on the abelian sandpile model of self-organised criticality, fractals, slow relaxation in magnets, percolation and animal problems, and growth models.

Dhar is a Fellow of all the three major Indian Science Academies. He is the recipient of the Young Scientist Award (1983), Shanti Swarup Bhatnagar Prize in Physics (1991), the J.R. Schrieffer Prize of the I.C.T.P. (1993), the S.N. Bose Medal of the Indian National Science Academy (2001), the T.W.A.S. Award in Physics (2003), and the **Boltzmann Medal** (2022).