

Deepak Dhar

Phase transitions in hard core models

These lectures give an short introduction to the fascinating world of phase transitions in models where particles interact with others with only hard-core interactions. In the first lecture, I will discuss the the system in one-dimensions, and discuss the so-called Tonks gas, and the Takahashi gas, and the quantum-mechanical Tonks gas. In the second lecture, I will discuss the general Lee-Yang theory of phase-transitions, and zeroes of partition function in the complex activity plane. In the third lecture, I will discuss the relation of the Yang-Lee edge singularity in d -dimensions to the problem of directed animals, and heaps in $(d+1)$ -dimensions.

Suggested references:

E. Lieb and D. C. Mattis, *Mathematical Physics in one Dimension: Chapter 1.*

C. N. Yang and T. D. Lee, *Phys. Rev.* 87 (1952) 404.

D. Dhar, in *Percolation Theory and Particle Systems*, Ed. Rahul Roy (Univ. Press, Hyderabad, 2000) [arXiv: 1703.07541].