Sommerfeld Theory Colloquium

Prof. Werner Krauth

Ecole Normale Supérieure, Paris, France

Two-Dimensional Melting Transitions: New Algorithms, New Insights

The hard-disk model has exerted outstanding influence on computational physics and statistical mechanics. Decades ago, hard disks were the first system to be studied by Markov-chain Monte Carlo methods and by molecular dynamics. It was in hard disks, through numerical simulations, that a two-dimensional melting transition was first seen to occur even though such systems cannot develop long-range crystalline order. Analysis of the system was made difficult by the absence of powerful simulation methods. In recent years, we have developed powerful Monte Carlo algorithms for hard disks and related systems. I will in particular show how the event-chain Monte Carlo algorithm has allowed us to prove that hard disks melt with a first-order transition from the liquid to the hexatic and a continuous transition from the hexatic to the solid. I will finally describe how a new factorized Metropolis filter transforms the event-chain algorithm into a paradigm for general Monte Carlo calculations. First results with the generalized algorithm have allowed us to establish the phase diagram for two-dimensional soft disks and Yukawa particles.

Wednesday, 29 April 2015, 16:15h, Room A34/349, Theresienstr. 37/III

Prof. L. Pollet