universität innsbruck

Department of Theoretical Physics

Theory Colloquium

Sasha Glazman, Department of Mathematics, University of Innsbruck

"Phase transitions in 2D models of statistical mechanics"

Abstract

Phase transitions are natural phenomena when a small change of external parameter, like temperature, leads to a drastic change of the properties of the material: ice melting to water, ferromagnets becoming paramagnets above the Curie temperature, etc. To study these phenomena, one introduces lattice models: particles are placed in a lattice and only adjacent particles interact. In two dimensions, this leads to beautiful physics theories of universality and conformal invariance. In mathematics, these statements largely remain mesmerizing conjectures.

A probabilistic approach has been very active since the work of Schramm in 2000 introducing Schramm-Loewner Evolution: random fractal curves appearing in the limit. The talk will start by describing the background and the connection to several branches of mathematics, using the seminal Ising model for ferromagnetism as an example. We then discuss phase diagrams of other models, including localization/delocalization transition for integer-valued Lipschitz function (random surface model).

The main ideas are positive correlation inequalities, ergodicity, planar duality. If time permits, we will briefly describe a recent breakthrough by Duminil-Copin and Manolescu who combined these methods with the Yang-Baxter equation to rigorously establish emergence of rotational invariance in the limit.

Wednesday | 09.11.2022 | 16:15

SR 1 | ICT building