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Mathematical Colloquia

Monday, 18 December 2017

17:15 h, Lecture Room B 78

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Optimal point configurations and their asymptotics

Abstract:

Large systems of points which minimize interaction energies appear in several fields of science, such as Mathematical Physics, Approximation Theory and Geometric Number Theory.

If N is the prescribed number of such points, the characterization of minimum-energy configurations at specific low values of N usually relies on ad-hoc methods, and often there seems to be no general pattern that predicts their structure. On the other hand, as the number of points N tends to infinity, crystallization often seems to occur, i.e. the minimizing configurations are conjecturally well-approximated by specific lattices.

The goal of the talk is to present three types of such minimization problems: 1) the basic energy-minimization based on pairwise interactions, 2) a multi-marginal optimal transport problem coming from computational quantum mechanics, and 3) the so-called Riesz polarization problem. The sharpest known results regarding large- N asymptotics of the minimizers will be compared, mentioning several open questions and conjectures on the way.