abstract

SPECIAL STATISTICAL MECHANICS SEMINAR
Topic:

Speaker:

Affiliation:

Date:

Time/Room:

A hiker holding an analog altimeter (with a needle indicating altitude modulo a constant χ) in one hand and a compass in the other traces an {\em altimeter-compass ray (ACR)} by walking in such a way that the altimeter and compass needles are always aligned (and thus direction is a linear function of altitude). Formally, if the terrain is described by a smooth real-valued function h on a planar domain, an ACR is a flow line of one of the complex vector fields $e^{2\pi i (\alpha + h/\chi)}$ (where $\alpha \in [0, 1)$ depends on how the hiker holds the altimeter).

When h is constant, the ACRs are the rays of Euclidean geometry. We show how to construct contour lines and ACRs when h is a certain wildly fluctuating random distribution called the {\bf Gaussian free field}. In this case, the ACRs are random fractal paths whose Hausdorff dimension depends on χ, and the contour lines of h are random fractal loops with dimension $3/2$.

We describe an explicit connection between "ACR trees" of the Gaussian free field and "exploration trees" of the so-called Gaussian loop
ensembles, which are conjectured scaling limits for O(n) loop models, as well as cluster boundaries in percolation and the Ising model.

This talk is based on joint work with Oded Schramm.