NIKOLAI CHERNOV MEMORIAL LECTURES

Hyperbolic Billiards: A Personal Outlook

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Lecture One: The Lorentz gas: where we stand and where I’d like to go.
Thursday, 10/5, 3:35-4:25 p.m. in 114 McAllister.

Abstract: The Lorentz gas is a simplified model of a gas of particles in a non homogeneous medium. Many results (old and new) are available for the case in which the inhomogeneities (scatterers) are periodic. I will try to give an idea of the state of the art for the case of high density scatterers and the obstacles that must be overcome to go beyond the periodic Lorentz Gas. In particular, I will comment on the random and the (weakly) interacting case.

Lecture Two: The functional analytic approach to billiards.
Saturday, 10/7, 9:00-9:50 a.m. in 114 McAllister.

Abstract: After the original approach of Bunimovich-Chernov-Sinai, then substantially improved by Young, Dolgopyat and Chernov, a new approach to the study of decay of correlations in billiards has been developed in the past years based on the direct study of the Transfer Operator on suitable Banach spaces. I will illustrate such an approach and explain some notable results recently obtained by it. Also I will mention the possible relevance of such results to the investigation of weakly interacting particles.

Lecture Three: Deterministic walks in random environment.
Sunday, 10/8, 9:00-9:50 a.m. in McAllister.

Abstract: A deterministic walk consists in a point with an internal state that moves in an environment according to a deterministic rule. When the environments under consideration are described by a probability distribution, then we call the environment random. I will discuss some simple models of deterministic walk in random environment and show in which sense they are a generalisation of random walks in random environment. Then I will present some recent results in the subject that, hopefully, are relevant for the study of the random Lorentz gas.