

Simons Lectures in Mathematics – Spring 2019



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Billiards, dynamics and moduli spaces of Riemann surfaces

Billiards in polygons can exhibit bizarre behavior, some of which can be explained by deep connections to several seemingly unrelated branches of mathematics. These include algebraic geometry (and in particular Hodge theory), Teichmüller theory and ergodic theory on homogeneous spaces. In the first lecture a gentle introduction to the subject will be given. Much of this lecture will be accessible to undergraduates and first-year graduate students. The topic of the second lecture is Ratner's celebrated theorems on unipotent flows in homogeneous spaces that have partial analogues in moduli space. I will outline the proof (joint with Maryam Mirzakhani and in part Amir Mohammadi) of one such theorem. The third lecture will be a survey of what is currently known about the classification of $SL(2, \mathbf{R})$ orbit closures. I will complete the proof of some results from Lecture 1. This lecture will have a more algebraic flavor than the others.

Lecture 1: Polygonal billiards and dynamics on moduli spaces of compact Riemann surfaces

Wednesday, April 3, 2019 – 4:00 pm, SCGP 102

Lecture 2: The classification of invariant measures

Thursday, April 4, 2019 – 4:00 pm, SCGP 102

Lecture 3: Orbit closures: theorems and counterexamples

Friday, April 5, 2019 – 2:30 pm, SCGP 102