2018 Distinguished Lecture Series

The Ergodic Hypothesis and Beyond

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Lecture 1: "The General Case" -

Tuesday, May 22, 2018, 3:00 – 3:50 p.m. MS 6627

The celebrated Ergodic Theorems of George Birkhoff and von Neumann in the 1930's gave rise to a mathematical formulation of Boltzmann's Ergodic Hypothesis in thermodynamics. This reformulated hypothesis has been described by a variety of authors as the conjecture that ergodicity -- a form of randomness of orbit distributions -- should be "the general case" in conservative dynamics. I will discuss remarkable discoveries in the intervening century that show why such a hypothesis must be false in its most restrictive formulation but still survives in some contexts. In the end, I will begin to tackle the question, "When is ergodicity and other chaotic behavior the general case?".

Lecture 2: The Robust Mechanisms for Chaos, I: Geometry and the Birth of Stable Ergodicity -

Wednesday, May 23, 2018, 3:00 – 3:50 p.m. MS 6627

The first general, robust mechanism for ergodicity was developed by E. Hopf in the 1930's in the context of Riemannian geometry. Loosely put, Hopf showed that for a negatively curved, compact surface, the "typical" infinite geodesic fills the manifold in a very uniform way, a property called equidistribution. I will discuss Hopf's basic idea in both topological and measure-theoretic settings and how it has developed into a widely applicable mechanism for chaotic behavior in smooth dynamics.

Lecture 3: Robust Mechanisms for Chaos, II: Stable Ergodicity and Partial Hyperbolicity -

Thursday, May 24, 2018, 3:00 – 3:50 p.m. MS 6627

Kolmogorov introduced in the 1950's a robust mechanism for {\em non-ergodicity}, which is now known as the KAM phenomenon (named for Kologorov, Arnol'd and Moser). A current, pressing problem in smooth dynamics is to understand the interplay between KAM and Hopf phenomena in specific classes of dynamical systems. I will describe a class of dynamical systems, called the {\em partially hyperbolic systems}, in which the two phenomena can in some sense be combined. I'll also explain recent results that give strong evidence for the truth of a modified ergodic hypothesis in this setting, known as the Pugh-Shub stable ergodicity conjecture.

UCLA College Mathematics

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