PIMS Distinguished Lecture Series

University of Regina

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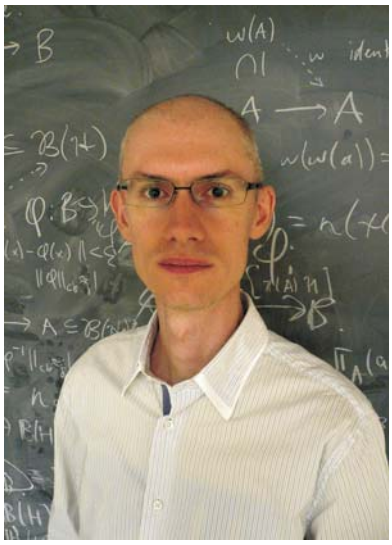

Friday
Nov. 12, 2010
3:30 p.m.
CL 408

Entropy in Dynamics

The concept of entropy was introduced into ergodic theory by Kolmogorov in the late 1950s. It can be viewed as a measure of the average information gained in learning that the orbit of an unidentified point visits a certain sequence of sets in a given partition of the space. This dynamical version of Shannon's information-theoretic entropy revolutionize the study of measure-preserving actions, which until then had relied on invariants of a spectral, as opposed to combinatorial, nature. Entropy theory as originally conceived by Kolmogorov was ultimately seen to apply most generally to actions of amenable groups, for which one can average over partial orbits in a way that produces a dynamical invariant.

Very recently Lewis Bowen showed, quite surprisingly, that the theory of measure entropy can be vastly extended to the realm of actions of countable sofic groups. Soficity is a much weaker kind of finite approximation property than amenability and is satisfied for example by all residually finite groups. The definition of entropy in this case required a completely new strategy that replaces the information-theoretic perspective with the statistical-mechanical idea of counting discrete models. Hanfeng Li and I have subsequently developed an alternative and more general approach to sofic entropy that uses operator algebras in an unexpectedly essential way. I will discuss all of these developments and furthermore indicate some applications of the ideas involved to the structure theory of operator algebras.

Mathematics and Statistics

Pacific Institute FOR THE MATHEMATICAL SCIENCES