Colloquium 2019-2020

Unless stated otherwise, colloquia are scheduled for Thursdays 4:15-5:15pm in WH-100E with refreshments served from 4:00-4:15 pm in WH-102.

Organizers: Vladislav Kargin, Cary Malkiewich, Anton Schick, and Adrian Vasiu

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Spring 2020

Friday January 31, 4:30-5:30pm, WH-100E (NOTE SPECIAL DATE AND TIME)
Speaker: **Daniel Studenmund** (University of Notre Dame)
Topic: Hidden symmetries of groups

> *Abstract*: Many infinite discrete groups fail to have nice properties only because of obstructions that disappear on passage to a finite-index subgroup. Examples of such properties include superrigidity of representations of linear groups and nilpotence of groups of polynomial growth. The collection of all finite-index subgroups of a fixed group Gamma has algebraic and geometric structures that can reflect properties of Gamma. We will discuss some of these structures, including the abstract commensurator of Gamma and commensurator growth of Gamma.

Thursday February 6, 4:15-5:15pm
Speaker: **Selim Sukhtaiev** (Rice University)
Topic: Anderson localization for disordered quantum graphs

> *Abstract*: Disorder is one of the central topics in modern science. In this talk, we will discuss a mathematical treatment of a particular disordered system modeling localization of quantum waves in random media. The model in question was introduced by P. W. Anderson in his Nobel prize winning work in physics which led to a rich mathematical theory of random Schrodinger operators. We will show that the transport properties of several natural Hamiltonians on metric trees with random branching numbers are suppressed by disorder. This phenomenon is called Anderson localization.

Friday February 7, 4:30-5:30pm (NOTE SPECIAL DATE AND TIME)
Speaker: **Li Chen** (University of Connecticut)
Topic: On several functional inequalities for Markov semigroups and their applications

> *Abstract*: Markov semigroups lie at the interface of analysis, PDEs, probability and geometry. Markov semigroup techniques, from both analytic and probabilistic viewpoints, have important applications in the study of functional inequalities coming from harmonic analysis, PDEs and geometry.
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> In this talk, we discuss regularization properties of heat semigroups and their applications to the study

of Sobolev type inequalities, isoperimetric inequalities and L^p boundedness of Riesz transforms in different geometric settings. Fractal examples without differential structures are emphasized. Besides, we also discuss sharp and dimension-free L^p bounds of singular integral operators via the martingale transform method.

Monday February 10
Speaker: **Benjamin Schmidt** (Michigan State University)
Topic: Preserve one, preserve all: Aleksandrov's problem in the context of Riemannian spaces.

Abstract: A classical theorem of Beckman and Quarles asserts that a function F from a Euclidean space of dimension at least two to itself and having the property that $||F(x)-F(y)||=1$ whenever $||x-y||=1$ is necessarily an isometry. Aleksandrov has been credited with the problem of determining those metric spaces having this “preserve one distance, then preserve all distances” property.

Examples show that Riemannian manifolds need not have this property. However, it is expected that self-functions of complete Riemannian manifolds that preserve a sufficiently small distance are isometries. I'll formulate a precise conjecture and will discuss supporting results proved jointly with Meera Mainkar.

Thursday March 19, 4:15-5:15pm, WH-100E
Speaker: **Kathryn Mann** (Cornell University)
Topic: TBA

Abstract: TBA

Thursday April 23, 4:15-5:15pm, WH-100E
Speaker: **Thomas Hartman** (Cornell University)
Topic: TBA

Abstract: TBA

PETER HILTON MEMORIAL LECTURE
Thursday April 30, 3:00-4:00pm, LH009 (NOTE SPECIAL TIME AND LOCATION)
Speaker: **Robert Gompf** (University of Texas at Austin)
Topic: Exotic Smooth Structures on $\mathbb R^4$

Abstract: One of the most surprising discoveries in 4-manifold topology was the existence of smooth manifolds homeomorphic, but not diffeomorphic, to Euclidean 4-space. For fundamental reasons, this phenomenon can only occur in 4 dimensions. We will survey the subject, from its origin to recent developments regarding symmetries of such manifolds.

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