IAS | WOMEN AND MATHEMATICS

A Program of the **Institute for Advanced Study** and **Princeton University**

Geometry and Randomness in Group Theory

May 15–26, 2017

LECTURERS

Goulnara Arzhantseva University of Vienna
Olga Kharlampovich Hunter College CUNY
Tatiana Nagnibeda University of Geneva
Kim Ruane Tufts University

ORGANIZERS

Lisa Carbone Rutgers University
Sun-Yung Alice Chang Princeton University
Dusa McDuff Barnard College and Columbia University
Christine Taylor Princeton University

Beginning Lectures

Free and Hyperbolic Groups / Olga Kharlampovich

Geometric Group Theory is built on the ideas and techniques from low dimensional topology, Riemannian geometry, analysis, combinatorics, probability, logic and traditional group theory. The course covers some aspects of geometric, asymptotic, and algorithmic group theory and exciting connections among them. Topics include: free groups, their properties and their subgroups via Stallings subgroup graphs; residual finiteness and its generalizations; groups given by generators and relations; Cayley graphs and the word metric; Van Kampen diagrams and Van Kampen's Theorem; word-hyperbolic groups and algorithmic properties of hyperbolic groups.

Examples of Non-Positively Curved Groups / Kim Ruane

Hyperbolic (or negatively curved) groups can be characterized in many different ways and essentially all of them turn out to be equivalent to Gromov's original definition of word hyperbolic groups. There have been many attempts to understand a wider class of non-positively curved groups using different properties -- both algebraic and geometric. In this course, we will discuss some of these properties and give examples of groups which fall into this wider class of non-postively curved groups because they satisfy one or more of these properties. We will also discuss some groups that should perhaps be in this class yet it is unclear how to prove whether they are or not.

Advanced Lectures

Random Groups / Goulnara Arzhantseva

There are two distinct aspects of infinite random groups. The first one is inspired by the natural idea to study a typical (or generic) representative of a given class of groups. The second aspect is based on the Erdős probabilistic method and provides exotic random groups, i.e., infinite groups with unusual properties. We will discuss both aspects, beginning with fundamentals such as small cancellation theory and expander graphs.

Amenability / Tatiana Nagnibeda

The notion of amenability was introduced by John von Neumann in 1929 in his work on the Banach-Tarski paradox. This very interesting property, defined for a locally compact group, turns out to be related to various areas of mathematics, such as measure theory, representation theory, geometry, probability theory and more -- giving way to a number of equivalent reformulations, some of them conjectural. The course is intended as an introduction into the theory of amenable groups. We will discuss amenability in relation to the algebraic structure of a (finitely generated) group, as well as to such geometric and probabilistic properties as growth, random walks and percolation.

This intensive mentoring program, supported by the National Science Foundation and a grant from the Schwab Charitable Fund made possible by the generosity of Eric and Wendy Schmidt, is for undergraduate, graduate, and postdoctoral women in mathematics. It will take place on the Institute for Advanced Study campus in Princeton, N.J., and will include lectures, seminars, and panel discussions on a wide range of topics of interest to women mathematicians.

Prerequisite: Undergraduate knowledge in group theory and topology.

Application and Information:
www.math.ias.edu/wam/2017
Application Deadline: **February 17, 2017**

All participants receive support for **shared** lodging, meals, and transportation.