

IAS

WOMEN AND MATHEMATICS



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

Curves, Loops, and Words in Geometry

May 9–20, 2016



LECTURERS

Moira Chas Stony Brook University
Moon Duchin Tufts University
Nancy Hingston The College of New Jersey
Nathalie Wahl University of Copenhagen

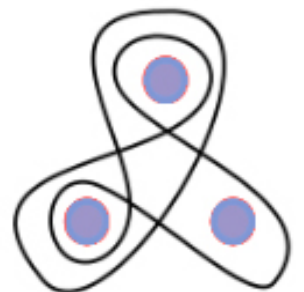
ORGANIZERS

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

Beginning Lectures

Computer Driven Questions and Theorems in Geometry / Moira Chas

Three numbers can be associated to a free homotopy class of closed curves on a surface S with boundary and negative Euler characteristic: the self-intersection number, the word length, and the length of the geodesic in the class. The interrelations of these three numbers exhibit many patterns when explicitly determined or approximated using nontrivial algorithms and a computer. We will discuss how these computations can lead to counterexamples of existing conjectures, to the discovery of new conjectures and to subsequent theorems in some cases.



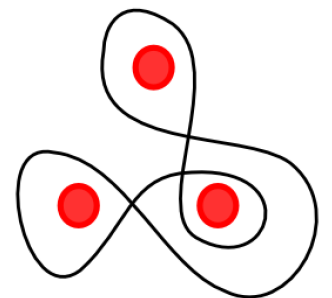
Closed Geodesics on Surfaces / Nancy Hingston

A light ray traveling on a surface traces out a geodesic path. The search for closed geodesics on surfaces goes back more than a hundred years, and has given rise to a beautiful interplay between geometry, analysis, and topology. We will introduce basic differential geometry of curves and surfaces in 3 dimensions, and some ideas that have been developed over the last century to prove the existence of closed geodesics. For example every closed, convex surface has at least 3 simple closed geodesics.

Advanced Lectures

Counting and Growth / Moon Duchin

Counting problems abound in geometry, but one of the most classical is the study of group growth, in which elements of a finitely generated group are organized by word length. Growth functions can be studied both coarsely (by asymptotic rate) and finely (by arithmetic properties). We will consider the fastest- and slowest-growing groups and some in between, with surprising connections to many fields of geometry along the way.



Structures on the Free Loop Space / Nathalie Wahl

The space of all loops in a space, i.e. all maps from a circle to the space, is known as its free loop space. It can be studied geometrically and algebraically, using appropriate models. This course will give an introduction to the free loop space and to string topology, which is the study of certain structures on the free loop space of a manifold.

This intensive mentoring program, sponsored by the National Science Foundation, is for undergraduate, graduate, and postdoctoral women in mathematics. It will take place on the campus of the Institute for Advanced Study in Princeton, N.J., and will include lectures, seminars, and panel discussions on a wide range of topics of interest to women mathematicians.

Prerequisite for this year's program is undergraduate knowledge in group theory and topology.

Application and Information:

www.math.ias.edu/wam/2016

Application Deadline: **February 19, 2016**

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

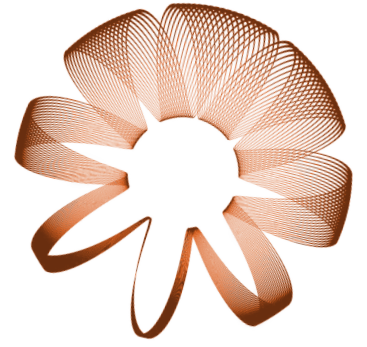


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