Plenary Lectures
Conférences plénières

DENIS AUROUX, Harvard University
An Invitation to Homological Mirror Symmetry

We will give a gentle introduction to some recent developments in the area of mirror symmetry, focusing on two key conjectures in the field: Kontsevich's homological mirror symmetry (1994), which relates the Fukaya category of a symplectic manifold to the derived category of coherent sheaves of a mirror space, and the Strominger-Yau-Zaslow (SYZ) conjecture (1996), which gives a geometric underpinning for the construction of mirror spaces. We will use simple examples to illustrate these conjectures and their extension beyond the Calabi-Yau setting in which they were first formulated. Specifically, we will focus on two one-dimensional examples, the cylinder and the pair of pants, to give a flavor of the geometric concepts involved in a general formulation of homological mirror symmetry.

CAROLINE COLIJN, Simon Fraser University
The forests and the trees: new metrics on some flavours of trees

Trees are discrete, tractable objects that arise in many applications, from biology to machine learning. These naturally give rise to several distinct kinds of trees: trees labelled at the tips, trees labelled uniquely or non-uniquely at all nodes, trees labelled at some nodes, unlabelled trees, bifurcating trees and so on. Comparing large-scale trees can help researchers to explore the dimension and shape of a suitably-defined space of trees, to characterize the behaviour of a simulation model or to analyze data. As the number of trees rises combinatorially with the number of leaves, for larger trees it makes sense to explore representing sets of trees with metrics and embedding them in simpler (Euclidean) spaces. We have developed metrics, in the sense of distance functions, on several of the above flavours of trees. For rooted, tip-labelled and partly-labelled trees, we embed the tree in a high-dimensional Euclidean space and use the Euclidean metric. Metrics on unlabelled trees are not easily obtained the same way; we describe two different approaches to comparing unlabelled trees. The second of these can be generalized to obtain polynomials that distinguish a quite general class of trees.

GREGORY LAWLER, University of Chicago
Random fractals from statistical physics

I will survey a number of interesting fractal subsets arising as scaling limit of models in statistical physics. There will be a focus on the recent interest in Minkowski content as the appropriate fractal measure on random sets.

GRIGORIS PAOURIS, Texas A&M University

PHAM HUU TIEP, Rutgers University
Finite groups, representations, character values, and applications

We discuss some basic problems and long-standing conjectures in representation theory of finite groups, and recent progress on some of these problems. We will also outline some applications of these and other results in representation theory of finite groups to various problems in group theory, number theory, and algebraic geometry.