Plenary Speakers
Conférences plénières

GEORGE ELLIOTT, University of Toronto
What is required for classification (when there is no moduli space)?

The classical notion of classification of mathematical structures depends on being able either to count the isomorphism classes, or at least to parametrize them by a reasonable space (either topological or Borel). When this cannot be done, and there are many such examples, for instance, countable groups, or countable rings, or separable C*-algebras, then one might hope, in any case, to find a functor to a simpler category—i.e., one with fewer automorphisms—which distinguishes isomorphism classes if not exactly parametrizing them. While, to form a simpler category, one cannot just identify morphisms modulo automorphisms, as this does not produce a category, it is possible to do this modulo inner automorphisms—if something like inner automorphisms exists in the category in question. Taking the closures of these equivalence classes in the topology of pointwise convergence (in the discrete topology, if there is nothing better) will then result in a well-behaved category, and a functor into it, and under modest conditions, which are satisfied for instance in the three categories mentioned above, this functor distinguishes isomorphism classes—it is a classification functor.

ALEXANDER KARP, Teachers College, Columbia University
Mathematicians and pre-college mathematics education: Thinking about productive involvement

The presentation will be devoted to a discussion of certain aspects of the current state of mathematics education in high and middle schools, and to the role that the mathematics community might play in its improvement. In particular, the discussion will touch on issues related to the content of the school course in mathematics and to the preparation and professional development of mathematics teachers.

STEPHEN KUDLA, University of Toronto
Algebraic cycles and Siegel modular forms

In this lecture I will discuss the role played by modular generating series for the classes defined by certain algebraic cycles on a class of locally symmetric varieties.

The theory of divisors modulo the divisors of rational functions on a smooth complex projective variety X is well understood. For example, for a smooth projective curve defined over a number field, the divisor classes of degree zero correspond to rational points on the Jacobian of X and this group is finitely generated by the Mordell-Weil Theorem. For algebraic cycles of higher codimension, our understanding is much more limited. For example, for a variety defined over a number field K, the Chow group of cycles of codimension r, $r > 1$, defined over K modulo rational equivalence is not known to be finitely generated.

The locally symmetric varieties X associated to rational quadratic forms of signature $(n, 2)$ are particularly nice test cases since they have explicitly constructed families of algebraic cycles of all codimensions. For a fixed codimension r, one can form a generating series for the classes of such special cycles. I will discuss (1) What information is contained in the statement that such a generating series is a modular form? (2) Borcherds' proof of modularity in the case of divisors. (3) Recent results of Wei Zhang, Martin Raum and Jan Bruinier for higher codimension.

MIKHAIL LYUBICH, SUNY Stony Brook

NORBERT SCHAPPACHER, Université de Strasbourg
Political Space Curves (Reflections on the centennial fate of a mathematical 'fact')

Mathematicians tend to view their science as cumulative ; what has once been proved belongs to a durable body of knowledge and will not be undone by future generations. Philosophers or historians of mathematics may find it difficult to be quite as enthusiastic. But when they point out that different standards of mathematical rigor prevailed at different times of the historical process, this hardly threatens the mathematicians' profound confidence in the perennity of their science.

The story I will tell in my talk on "Political Space Curves" suggests a different question, which may get us closer to what is really going on : How exactly do mathematic(ian)s manage to generate stable knowledge ? A steady creative reinvention of truth seems to do the trick. In passing, we will see that controversies do in fact exist in mathematics, but they tend to do surprisingly little to unveil the truth.

DANIEL WISE, McGill
Cube Complexes

Cube complexes have come to play an increasingly central role within geometric group theory, as their connection to right-angled Artin groups provides a powerful combinatorial bridge between geometry and algebra. This talk will primarily aim to introduce nonpositively curved cube complexes, and then describe some of the developments that have recently culminated in the resolution of the virtual Haken conjecture for 3-manifolds, and simultaneously dramatically extended our understanding of many infinite groups.