Geometric Topology
Topologie géometrique
(Org: **Steve Boyer** (UQAM), **Ryan Budney** (Victoria) and/et **Dale Rolfsen** (UBC))

TOM BAIRD, Memorial University of Newfoundland
Moduli Spaces of Vector Bundles over a real curve.

Moduli spaces of holomorphic bundles over a complex projective curve have been an important object of study for more than 50 years. In a highly influential paper from the '80s, Atiyah and Bott used Morse theory of the Yang-Mills functional to compute the Betti numbers of these moduli spaces. More recently, the moduli space of vector bundles over a real curve has garnered a great deal of interest. I will define these moduli spaces, and explain how to adapt the Atiyah-Bott method to compute their Betti numbers in characteristic 2.

BEN BURTON, The University of Queensland
Regina in Regina: Adventures in computation with knots and 3-manifolds

Regina is a software package for studying 3-manifold triangulations and normal surfaces. It includes a graphical user interface and Python bindings, and also supports angle structures, census enumeration, combinatorial recognition of triangulations, and high-level functions such as 3-sphere recognition and connected sum decomposition. In this talk we describe how Regina has been used to compute crosscap numbers of knots (the non-orientable counterpart to knot genus), drawing on techniques from 3-manifold topology, integer programming, and computational algebra.

RADU CEBANU, UQAM
Knots in lens spaces with $S^1 \times S^2$ surgeries

We use Heegaard-Floer methods to investigate when a knot in a lens space has a longitudinal $S^1 \times S^2$ surgery. The main result is that such a knot has a genus 0 generalized Seifert surface. Further restrictions on its Knot Floer Homlogy will be given and then some related questions and conjectures will be formulated.

ADAM CLAY, Université du Québec à Montréal
Foliations of graph manifolds and left-orderability

There is a conjectured relationship between left-orderability of the fundamental group of a 3-manifold M, the existence of taut foliations in M, and whether or not M is an L-space. We show that when M is a rational homology sphere graph manifold, M admits a co-orientable taut foliation if and only if the fundamental group of M is left-orderable. The proof is constructive, inspired by known surgery results relating to foliations and L-spaces. In particular, the construction allows us to associate nice properties of foliations in M with nice properties of left-orderings of the fundamental group of M, and vice versa. This is joint work with Liam Watson and Steve Boyer.

ZSUZSANNA DANCSO, Fields Institute
Odd Khovanov homology via hyperplane arrangements

We construct cohomology groups associated to arrangements of hyperplanes which are invariant under Gale duality. Hyperplane arrangements can be thought of as generalisations of various interesting mathematical objects, such as graphs and links. When specialised to planar graphs, Gale duality is planar graph duality. When restricted to links, we obtain an odd categorification of the Jones polynomial similar to the odd Khovanov homology of Ozsvath, Rasmussen and Szabo.

Joint work with Anthony Licata.

TETSUYA ITO, UBC
Open book foliation and incompressible surfaces

An open book foliation is a generalization of Birman-Menasco's braid foliation theory adapted to general open book decompositions and closed braids of 3-manifolds. This method is useful to study contact structures of 3-manifolds. In this talk, we give a topological application of open book foliation techniques: We provide an estimation of the genus of essential surfaces in open books, in terms of its monodromy. This provides a purely algebraic criterion for 3-manifolds to be irreducible or atroidal. In particular, it gives a relationship between topology of 3-manifolds and left-orderings of mapping class groups. This is a joint work with Keiko Kawamuro (Univ. Iowa).

WILLIAM JACO, Oklahoma State University
Minimal triangulations of certain 3-manifolds

We identify minimal triangulations of certain 3-manifolds and specifically will show that a minimal triangulation of the product $S_g \times [0,1]$ where S_g is a closed, orientable surface of genus g is $10g - 4$. Furthermore, any such minimal triangulation is an inflation of a join with a minimal triangulation of the surface S_g.

DAVID KREBES, none
Units of the String Link Monoids

We discuss the result that the map obtained by viewing a geometric (ie. representative) braid as a string link induces an isomorphism of the n-strand braid group onto the group of units of the n-strand string link monoid (and in turn the (n,n) tangle monoid).

EDUARDO MARTINEZ-PEDROZA, Memorial University of Newfoundland
Coherence and Negative Sectional Curvature in Complexes of Groups

A group is coherent if finitely generated subgroups are finitely presented. We examine a condition on a simply connected 2-complex X ensuring that if a group G acts properly on X then G is coherent. This extends earlier work of D.Wise on 2-complexes with negative sectional curvature in the case that G acts freely. Our extension of this result involves a generalization of the notion of combinatorial sectional curvature, a version of the combinatorial Gauss-Bonnet theorem to complexes of groups, and requires the use of ℓ^2-Betti numbers. This is joint work with D. Wise, McGill U.

MIKAEL PICHOT, McGill University
Randomizing higher rank lattices

I will explain the idea of intermediate rank for discrete groups acting on spaces of nonpositive curvature and show how to define new models of random groups in this framework, by randomizing chains of lattices in Lie groups of rank 2. This is joint work with Sylvain Barre.

LIAM WATSON, UCLA
Heegaard Floer homology and the fundamental group

A group is left-orderable if it admits a strict total order of its elements that is invariant under multiplication on the left. As an immediate consequence, left-orderable groups are torsion free. For example, a finite cyclic group cannot be left-ordered; hence the fundamental group of a lens space is not left-orderable. L-spaces provide a generalization of lens spaces in the context of Heegaard Floer homology. These manifolds have simplest possible Heegaard Floer homology, though they need not have cyclic (or even finite) fundamental group. This talk will describe some evidence supporting the conjecture that L-spaces are equivalent to 3-manifolds with non-left-orderable fundamental group.