CIRGET 13th Anniversary Reunion Workshop
10-12 mai 2010
SH-3620, Sherbrooke Building
200 Sherbrooke Street West
UQAM

May 10 - Low-dimensional Topology

9:30-10:30 Stefan Friedl (Warwick)

Twisted Alexander polynomials of hyperbolic knots

I will talk about an invariant for hyperbolic knots which has many interesting, albeit little understood properties. This talk will be mostly based on computational evidence and almost entirely proof-free. No previous knowledge of low-dimensional topology will be required.

11:00-12:00 David Gay (Euclidlab)

Indefinite Morse 2-functions

This is joint work with Rob Kirby, inspired and motivated by work of Tim Perutz and Yanki Lekili on the possibility of extracting smooth 4-manifold invariants from broken Lefschetz fibrations over the sphere. A "Morse 2-function" is a suitably generic smooth map from an n-manifold to a 2-manifold, just as a Morse function is a suitably generic map to a 1-manifold. Locally, Morse 2-functions look like $(t,p) \mapsto (t,g_t(p))$, where g_t is a generic homotopy between Morse functions (on an (n-1)--manifold), so thinking about Morse 2-functions is something like thinking about Cerf theory when you can't say globally what direction should be called "time". An indefinite Morse 2-function is one in which, in this local model, the Morse function g_t never has critical points of minimal or maximal index. We prove existence and uniqueness results for indefinite Morse 2-functions over the disk and the sphere. "Uniqueness" means that homotopic indefinite Morse 2-functions can be connected by generic homotopies which are indefinite at all intermediate times. Some of our results have already been proved by Saeki and Williams, but we have a number of important improvements, most notably that we can keep fibers connected at all times and that the results for the sphere follow as corollaries from the results for the disk. We also think that the perspective on Morse 2-functions which comes from our methods of proof is enlightening in and of itself and worth sharing.

13:30-14:30 Paolo Ghiggini (Nantes)

Tight contact structures on \Sigma (2,3,6n-1)

I will describe the classification of tight contact structures on the Seifert manifolds \Sigma (2,3,6n-1). This is partially a joint work with Jeremy Van Horn-Morris.

15:00-16:00 Joseph Maher (CUNY, College of Staten Island)

Random Heegaard splittings

A handlebody is a regular neighbourhood of a graph in R^3. Every closed 3-manifold may be constructed by gluing two handlebodies together along their boundaries, and the gluing map is homeomorphisms between the two boundary surfaces, and so determines an element of the mapping class group. We show that if you take a random walk of length n on the mapping class group then the probability that the resulting 3-manifold is hyperbolic tends to 1 as n tends to infinity.

16:15-17:15 Genevieve Walsh (Tufts)

The bumping set and the characteristic submanifold

Given a geometrically finite Kleinian group G, we investigate the relationship between the limit set of G and the characteristic submanifold of the quotient manifold with boundary.

May 11 - Symplectic Topology

10:00-11:00 Tony Rieser (Université de Montréal)

Blowing up and down Lagrangian submanifolds and Real Packing

Given a symplectic manifold (M,ω) and a Lagrangian submanifold L, we construct versions of the blow-up and blow-down, familiar from complex algebraic geometry and symplectic topology, which are defined relative to L. Furthermore, if M admits an anti-symplectic involution ϕ, i.e. a diffeomorphism such that $\phi^2=\mathbb{1}$ and $\phi^*\omega=-\omega$, and we blow-up an appropriately symmetric configuration of symplectic balls, then we show that there exists an antisymplectic involution on the blow-up $\tilde{M}$ as well. We derive a homological condition for real Lagrangian surfaces $L=\text{Fix}(\phi)$ which determines when the topology of L changes after a blow down, and we then use these constructions to study the real packing numbers for real Lagrangian submanifolds in symplectic four-manifolds.

11:30-12:30 Silvia Anjos (IST, Lisbonne)

Topology of symplectomorphism groups of some blow-ups of the projective plane

By a result of Kedra and Pinsonnault, we know that the topology of groups of symplectomorphisms of symplectic 4-manifolds is complicated in general. However, in all known (very specific) examples, the rational cohomology rings of symplectomorphism groups are finitely generated. In this talk, we compute the homotopy Lie algebra of groups of symplectomorphisms of some blow-ups of the projective plane and show it is infinite dimensional. Moreover, we explain how the topology is generated by the toric structures one can put on the manifold. This is joint work with Martin Pinsonnault.

14:00-15:00 Martin Pinsonnault (University of Western Ontario)

Symplectic packings of rational ruled surfaces

We will explain how recent results of B-H. Li, T.-J. Li, A. K. Liu, and Gao on symplectic cones leads to a concrete understanding of the packing problem for rational ruled surfaces. If time permits, we will also explain how this relates to recent work of M. Hutchings on embedded contact homology.

15:30-16:30 Rémi Leclercq (Université de Montréal)

Triviality of the relative Seidel morphism for symplectically aspherical Lagrangians and consequences

By using suitable algebraic structures on Morse homology and Lagrangian Floer homology, I will prove that the Lagrangian analogue of the Seidel morphism, which is due to Shengda Hu and François Lalonde, is trivial when one considers symplectically aspherical Lagrangians. I will derive from this several consequences, in terms of homological Lagrangian monodromy (joint work with S. Hu and F. Lalonde) and in terms of spectral invariants.

May 12 - Differential Geometry

10:00-11:00 Erwan Rousseau (Strasbourg)

Applications holomorphes et feuilletages

Nous présenterons quelques résultats de dégénérescence des applications holomorphes tangentes à un feuilletage sur une variété projective complexe, généralisant les travaux de McQuillan sur les surfaces. Travail en commun avec C. Gasbarri et G. Pacienza.

11:30-12:30 Diego Matessi (Università del Piemonte orientale)

Conifold transitions and Lagrangian fibrations

I will discuss an interpretation of "conifold transitions" of Calabi-Yau manifolds in terms of Lagrangian fibrations. After a description of the local models, I will explain a global example, where obstructions can be interpreted using some ideas from the Gross-Siebert work on affine manifolds with singularities and the discrete Legendre tranform.

14:00-15:00 Dimiter Vassilev (University of New Mexico)

Quaternionic contact structures and applications to special holonomy metrics.

Quaternionic contact structures appear naturally on the boundary at infinity of asymptotically symmetric Einstein metrics (quaternionic-Kähler metrics). Distinguished classes are given by vanishing torsion or conformally flat quaternionic contact metrics. The former will be related to the well-known 3-Sasakian structures and examples will be given for the latter. We outline a way to obtain explicit special holonomy metrics and other interesting examples on the product of a quaternionic contact structure with the real line.