Geometry and Topology in Low Dimensions: Interactions with Floer theory
Géométrie et topologie en basse dimension : interactions avec la théorie de Floer
(Org: **Cagatay Kutluhan** (University of Buffalo) and/et **Liam Watson** (Sherbrooke University))

JOHN BALDWIN, Boston College
Stein fillings and SU(2) representations

In recent work, Sivek and I defined invariants of contact 3-manifolds with boundary in sutured instanton Floer homology. I will sketch the proof of a theorem about these invariants which is analogous to a result of Plamenevskaya in Heegaard Floer homology: if a 4-manifold admits several Stein structures with distinct Chern classes, then the invariants of the induced contact structures on its boundary are linearly independent. As a corollary, we conclude that if a homology sphere Y admits a Stein filling which is not a homology ball, then its fundamental group admits a nontrivial representation to SU(2). This is joint work with Steven Sivek.

HANS BODEN, McMaster
Concordance of virtual knots

This talk will examine concordance for virtual knots. The main theorem is that two classical knots are concordant as virtual knots if and only if they are concordant as classical knots. This result is joint work with Matthias Nagel, and it answers a question raised in papers by Kauffman and Turaev. It follows that inclusion induces an injection from the concordance group of classical knots into the concordance group of long virtual knots. We give examples of slicing virtual knots in terms of their Gauss diagrams, and time permitting, present some new results on concordance invariants for virtual knots, which represents joint work in progress with Micah Chrisman and Robin Gaudreau.

WENZHAO CHEN, Michigan State University
Upsilon invariant and Cabling

Derived from knot Floer homology, the Upsilon invariant can be viewed as a homomorphism from the smooth knot concordance group to the group of piecewise linear functions on $[0,2]$, which generalizes an earlier known concordance invariant τ. It is natural to ask how Upsilon invariant behaves under the cabling operation. As a partial answer to this question, in this talk we will show an inequality relating the Upsilon invariant of a knot and that of its cable, obtained by generalizing the work of Hedden and Van Cott on τ-invariant of cable knots. We will also discuss some applications of this inequality.

DAVID DUNCAN, McMaster University
Heat flows for cylindrical end manifolds

We discuss several recent results for heat flows on cylindrical end manifolds, and mention applications to Floer-type invariants.

JONATHAN HANSELMAN, University of Texas at Austin
Bordered Floer modules as immersed curves in the torus

We consider bordered Heegaard Floer homology of 3-manifolds with boundary a torus. As originally defined, these invariants take the form of differential or $\mathcal{A}_\infty$ modules over a particular algebra. We show that these objects can be replaced by collections of immersed curves in the boundary torus minus a basepoint, decorated with local systems. Recovering $\widehat{HF}$ of a closed manifold from two bordered Floer invariants typically involves taking the homology of a tensor product of modules; in our setting, we show that $\widehat{HF}$ is obtained by simply counting intersection points of the corresponding immersed curves. The moral of the talk is: bordered Heegaard Floer homology is not as scary as it looks! In addition to making many computations easier, this

geometric perspective leads to simple proofs of some important results about L-spaces. This is joint work with J. Rasmussen and L. Watson.

KRISTEN HENDRICKS, Michigan State University
Involutive Heegaard Floer homology

We use the conjugation symmetry on the Heegaard Floer complexes to define a three-manifold invariant called involutive Heegaard Floer homology, which is meant to correspond to $\mathbb{Z}_4$-equivariant Seiberg-Witten Floer homology. From this we obtain two new invariants of homology cobordism, explicitly computable for surgeries on L-space knots and quasi-alternating knots, and two new concordance invariants of knots, one of which (unlike other invariants arising from Heegaard Floer homology) detects non-sliceness of the figure-eight knot. We also give a formula for how this theory behaves under connected sum, and use it to give examples not homology cobordant to anything computable via our surgery formula. This is joint work with C. Manolescu; the last part of is also joint with I. Zemke.

YING HU, UQAM
Left-orderability and representations into subgroups of $Homeo_+(S^1)$

In this talk, I will discuss the relationship between left-orderability of a group and its representations into $Homeo_+(S^1)$, the homeomorphism group of a circle. In particular, I will show an equivalent relationship between certain 3-manifold groups being left-orderable and the existence of a representation of the group into a specific subgroup of $Homeo_+(S^1)$.

FRANCESCO LIN, Princeton
Khovanov homology in characteristic two and $Pin(2)$-symmetry

Bar-Natan has introduced for a link L in S^3 a variant of Khovanov homology which is defined only over fields of characteristic two. We discuss a geometric interpretation of his construction: we show how a version of his invariant naturally appears as the E^2-page of the analogue of the Ozsváth-Szabó spectral sequence for the branched double cover in the context of $Pin(2)$-monopole Floer homology. Conjecturally, this spectral sequence converges to a version of the Floer homology of the branched double cover.

THOMAS MARK, University of Virginia
Obstructing Stein structures on contractible 4-manifolds

A Stein manifold is a complex manifold with particularly nice convexity properties. In real dimensions above 4, existence of a Stein structure is essentially a homotopical question, but for 4-manifolds the situation is more subtle. We will show that there exist homotopically trivial smooth 4-manifolds that do not admit Stein structures, answering a question that has circulated among contact and symplectic topologists recently. Along the way we will provide new evidence for a conjecture of Gompf, which asserts that a nontrivial Brieskorn homology sphere cannot be embedded in complex 2-space as the boundary of a Stein submanifold.

JEREMY VAN HORN-MORRIS, University of Arkansas
Incorporating genus into the Heegaard Floer differential

Utilizing work of Hutchings and Kutluhan-Lee-Taubes, one can incorporate the genus of holomorphic curves into the Heegaard Floer differential of the Honda-Kazez-Matic description of the Heegaard Floer complex associated to an open book decomposition. We will describe how this can be used to define a version of the Oszvath-Szabo contact invariant that is more sensitive to tightness and to Stein cobordisms. This is joint work with Cagatay Kutluhan, Gordana Matic and Andy Wand.

IAN ZEMKE, UCLA

Link cobordisms and functoriality in link Floer homology

We will outline an approach to defining cobordism maps in link Floer homology for link cobordisms decorated with a set of divides. We will describe the maps for simple link cobordisms. As an application, we will describe a relation involving the dividing sets in a "bypass triangle" and show how this relation recovers the formula for the Sarkar map on link Floer homology, as well as other similar relations. We will additionally describe a grading change formula, which recovers well known bounds on the invariant tau.