

# Workshop Schedule

Events for:  
**Monday, January 11th - Friday, January 15th**

## Monday, January 11th

1:00pm **Andras Juhasz**

**Speaker:** Andras Juhasz

**Title:** Transverse invariants and exotic surfaces in the 4-ball

**Abstract:** Using 1-twist rim surgery, we construct infinitely many smoothly embedded, orientable surfaces in the 4-ball bounding a knot in the 3-sphere that are pairwise topologically isotopic, but not ambient diffeomorphic. We distinguish the surfaces using the maps they induce on perturbed sutured Floer homology. Along the way, we show that the cobordism map induced by an ascending surface in a Weinstein cobordism preserves the transverse invariant in knot Floer homology. This is joint work with Ian Zemke.

3:00pm **Claudius Zibrowius**

**Speaker:** Claudius Zibrowius

**Title:** L-space knots have no essential Conway spheres

**Abstract:** In 2013, Allison Moore and Tye Lidman conjectured that any knot in  $S^3$  that admits a non-trivial surgery to an L-space does not contain an essential Conway sphere. In recent joint work (arXiv preprint 2006.03521), we prove this conjecture. Our proof is based on a certain Heegaard Floer invariant HFT for 2-strand tangles that I developed in earlier work. I will discuss the main ideas of our proof with particular focus on symmetries of HFT.

## Tuesday, January 12th

1:00pm **Masaki Taniguchi**

**Speaker:** Masaki Taniguchi

**Title:** Filtered instanton Floer homology and the homology cobordism group

**Abstract:** We introduce a family of real-valued homology cobordism invariants  $r_s(Y)$  of oriented homology 3-spheres. The invariants  $r_s(Y)$  are based on a quantitative construction of filtered instanton Floer homology. Using our invariants  $r_s(Y)$ , we give several new constraints of the set of smooth compact 4-manifolds bounded by homology 3-spheres. As one of the corollaries, we give infinitely many homology 3-spheres which cannot bound any definite 4-manifold. As another corollary, we show that if the 1-surgery of a knot has negative Frolov invariant, then the  $1/n$ -surgeries ( $n > 0$ ) of the knot are linearly independent in the homology cobordism group. This is joint work with Yuta Nozaki and Kouki Sato.

3:00pm **John Baldwin**

**Speaker:** John Baldwin

**Title:** Sutured instanton homology and Heegaard diagrams

**Abstract:** It is an open question how instanton Floer homology is related to the other main Floer-homological invariants of 3-manifolds, those being Heegaard Floer homology, monopole Floer homology, and embedded contact homology, which are all known to be isomorphic to one another. I'll describe recent work with Zhenkun Li and Fan Ye motivated by this question, in which we prove that the dimension of the sutured instanton homology of a balanced sutured manifold is bounded above by the number of generators in any sutured Heegaard Floer complex for the manifold. Among other things, it follows that strong L-spaces are instanton L-spaces

**Wednesday, January 13th**

1:00pm **Jen Hom**

**Speaker:** Jen Hom

**Title:** Infinite order rationally slice knots

**Abstract:** A knot in  $S^3$  is rationally slice if it bounds a disk in a rational homology ball. We give an infinite family of rationally slice knots that are linearly independent in the knot concordance group. In particular, our examples are all infinite order. All previously known examples of rationally slice knots were order two. The proof relies on bordered and involutive Heegaard Floer homology. This is joint work with Sungkyung Kang, JungHwan Park, and Matt Stoffregen.

3:00pm **Donghao Wang**

**Speaker:** Donghao Wang

**Title:** Monopole Floer homology for 3-manifolds with toroidal boundary

**Abstract:** The monopole Floer homology of an oriented closed 3-manifold was defined by Kronheimer-Mrowka and has greatly influenced the study of 3-manifold topology since its inception. In this talk, we will generalize their construction and define the monopole Floer homology for any pair  $(Y, \eta)$ , where  $Y$  is a compact oriented 3-manifold with toroidal boundary and  $\eta$  is a suitable closed 2-form, which satisfies a reasonable  $(3+1)$  TQFT property. Its graded Euler characteristic recovers the Milnor-Turaev torsion invariant by a classical theorem of Meng-Taubes. We will explain its relation with gauged Landau-Ginzburg models, and how this framework leads to a tentative bordered monopole theory.

## Thursday, January 14th

1:00pm **Zhenkun Li**

**Speaker:** Zhenkun Li

**Title:** Instanton Floer homology of  $(1,1)$ -knot

**Abstract:** Instanton knot homology was first introduced by Floer and was revisited by Kronheimer and Mrowka via sutured instanton Floer homology. As the nature of instanton theory, the computation of instanton knot homology is in general very difficult. In this talk, we present the computations of some families of  $(1,1)$ -knots, including all torus knots. The computation involves two technical results, which are also interesting on their own. The first is to extract information about instanton theory from the Heegaard diagrams of 3-manifolds and knots. The second is to relate the Euler characteristics of sutured Instanton Floer homology and sutured Floer homology that was introduced by Juhász. This is a joint work with Fan Ye.

3:00pm **Ian Zemke**

**Speaker:** Ian Zemke

**Title:** A few refinements of Heegaard Floer genus bounds

**Abstract:** In this talk, we will discuss some improvements to known Heegaard Floer genus and clasp number bounds. We define a family of concordance invariants  $Y_n(K)$  which sometimes give better slice genus bounds than the best previous known bounds from Rasmussen's  $V_n(K)$ . The invariants  $Y_n(K)$  have a simple description in terms of the existence of local maps between knot-like complexes. Using similar techniques, we are also able to show that Hendricks and Manolescu's involutive correction terms also give a slice genus bound. This project is joint work with Andras Juhász.

## Friday, January 15th

1:00pm **Sherry Gong**

**Speaker:** Sherry Gong

**Title:** Non-orientable cobordisms and torsion in Floer homology

**Abstract:** We use unoriented versions of instanton and knot Floer homology to give bounds on the number of critical points appearing in not-necessarily orientable cobordisms, extending results of a recent paper by Juhasz, Miller, and Zemke concerning orientable cobordisms. The versions of instanton and knot Floer homology that induce maps for non-orientable cobordisms require a decoration-much of the subtlety in our arguments lies in choosing the necessary decorations. We introduce unoriented versions of the band unknotting number and the refined cobordism distance and use our results to give bounds on these based on the torsion orders of the Floer homologies.

3:00pm **Kristen Hendricks**

**Speaker:** Kristen Hendricks

**Title:** Surgery formulas for involutive Heegaard Floer homology

**Abstract:** We prove a surgery formula for the involutive variant of Heegaard Floer homology, and use it to show that the integer homology cobordism group is not generated by Seifert fibred spaces. This is joint work with J. Hom, M. Stoffregen, and I. Zemke.