Stefan Friedl
Title: Twisted Alexander polynomials of hyperbolic knots
Abstract: Given a hyperbolic knot we study the twisted Alexander polynomial as a function on the character variety and corresponding to the discrete and faithful representation.
In particular we will discuss formal properties of such polynomials and their relation to fiberedness, chirality, the volume and the knot genus.
This is based on joint work with Nathan Dunfield, Nicholas Jackson, Taehee Kim and Takahiro Kitayama.

Paulo Ghiggini and Ko Honda
Title: From HF to ECH via open book decompositions I & II
Abstract: This is a series of two talks aimed at showing an isomophism between the hat-versions of Heegaard-Floer homology (HF) and of embedded contact homology (ECH). Heegaard-Floer homology, defined by Ozsváth and Szabó, is constructed from a Heegaard splitting of a three manifold and embedded contact homology,
defined by Hutchings and Taubes, is constructed from a contact form.

In our proof of HF=ECH we use open book decompositions as interpolating objects between Heegaard splittings and contact forms. The first step in the proof is to reduce the computation of both \widehat{HF} and ECH to complexes defined from the page and the monodromy of the open book. Then we construct chain maps between these modified HF and ECH complexes by counting pseudo-holomorphic maps in suitably defined symplectic cobordisms. Finally we prove that the maps induced in homology are inverse of each other by degenerating the cobordisms and performing a relative Gromov-Witten computation.

This is a joint work with Vincent Colin.

In Part I I will explain how adapt the ECH complex to an open book decomposition, and in part II Ko Honda will explain the construction of the chain maps between \widehat{HF} and \widehat{ECH}.

Eli Grigsby
Title: On Khovanov-Seidel quiver algebras and bordered Floer homology
Abstract: I will discuss a relationship between Khovanov- and Heegaard Floer-type homology theories for braids.  Specifically, I will explain how the bordered Floer homology bimodule associated to the double-branched cover of a braid is related to a similar bimodule defined by Khovanov and Seidel.  This is joint work with Denis Auroux and Stephan Wehrli.

Matt Hedden
Title: Unlink detection and the Khovanov module
Abstract: Kronheimer and Mrowka recently showed that Khovanov homology detects the unknot. Their proof does not obviously extend to show that Khovanov homology detects unlinks of more than one component, and one could reasonably question whether it actually does (the Jones polynomial, for instance, does not detect unlinks with multiple components). In this talk, I'll discuss how to use a spectral sequence of Ozsvath and Szabo in conjunction with Kronheimer and Mrowka's result to settle the question (in the affirmative). This project is joint with Yi Ni, and had its birth at the Banff workshop two years ago.

Jen Hom
Title: Concordance and the knot Floer complex
Abstract: We will use the knot Floer complex, in particular the invariant epsilon, to define a new smooth concordance homomorphism. Applications include a formula for tau of iterated cables, better bounds (in many cases) on the 4-ball genus than tau alone, and a new infinite family of smoothly independent topologically slice knots. We will also discuss various algebraic properties of this construction, including a total ordering, a ``much greater than'' relation, and a filtration.

Cagatay Kutluhan
Title: Heegaard Floer meets Seiberg--Witten
Abstract: Recently Yi-Jen Lee, Clifford Taubes, and I have announced a proof of the conjectured isomorphisms between Heegaard Floer and Seiberg--Witten Floer homology groups of a 3-manifold. The purpose of this talk is to outline our construction of these isomorphisms

Tye Lidman
Title: Heegaard Floer Homology and Triple Cup Products
Abstract: We use the recent link surgery formula of Manolescu and Ozsv\'ath as well as the theory of surgery equivalence of three-manifolds due to Cochran, Gerges, and Orr to relate Heegaard Floer homology to the cup product structure for a closed oriented three-manifold. In particular, we give a complete calculation of the infinity flavor of Heegaard Floer homology for torsion Spin^c structures with mod 2 coefficients. This establishes an isomorphism with Mark's cup homology, mod 2, a homology theory defined solely using the triple cup product form.

Ciprian Manolescu:
Title: A step-by-step algorithm to compute 3- and 4-manifold invariants
Abstract: I will describe an algorithm for computing the Heegaard Floer invariants of three- and four-manifolds (modulo 2). The algorithm is based on presenting the manifolds in terms of links in S^3, and then using grid diagrams to represent the links. To compute the invariants, one uses certain positive domains on the grid, which can be encoded into "formal complex structures". One needs to check that all formal complex structures on the grid are homotopic - this is known to be true for certain grids called sparse, and conjectured to hold in general. The talk is based on joint work with P. Ozsvath and D. Thurston.

Dan Margalit
Title: Combinatorics of Torelli groups
Abstract: The Torelli group of a surface is the subgroup of the mapping class group consisting of elements that act trivially on the homology of the surface. One interesting subgroup of the Torelli group is the set of elements commuting with some hyperelliptic involution. It has been conjectured that this subgroup is generated by Dehn twists. I will present some progress on this conjecture. A key ingredient is a new proof that the Torelli group is generated by bounding pair maps. This is joint work with Tara Brendle and Allen Hatcher.

Tom Mrowka
Title: Filtrations on Singular Instanton Knot Homology.
Abstract: This talk will discuss two filtrations that arise on Singular Instanton Knot Homology that refine the spectral sequence beginning with Khovanov homology and converging to the Singular Instanton Knot Homology. This is joint work with Peter Kronheimer.

Lenny Ng
Title: Transverse homology and its properties
Abstract: After a brief summary of knot contact homology and some of its properties, I'll describe how a contact structure induces filtrations on the underlying complex that yield an invariant of transverse knots, transverse homology (joint with Tobias Ekholm, John Etnyre, and Michael Sullivan). I'll try to provide some perspective on the mysterious nature of this invariant, with emphasis on its general behavior and comparison to previously developed transverse invariants. If time permits, I'll discuss how transverse homology might produce a new Bennequin-type bound on self-linking number.

Brendan Owens
Title: Alternating links and rational balls
Abstract: For a slice knot K in the 3-sphere it is well known that the double branched cover Y_K bounds a smooth rational homology 4-ball. Paolo Lisca has shown that this condition is sufficient to determine sliceness for 2-bridge knots,

and that this generalises to 2-bridge links. I will discuss the problem of determining whether $Y_L$ bounds a rational ball when L is an alternating link.

Jongil Park
See PDF below

Tim Perutz:
Title: The Fukaya category of the punctured 2-torus.
Abstract: In effect, Heegaard Floer theory takes place invokes the Fukaya category of the g-fold symmetric product of a genus g surface, with a filtration arising from a basepoint. The structure of this category is non-trivial to describe even in the genus-one case, and that is the subject of this talk. The filtered Fukaya category of the torus is generated by two circles, but it carries an interesting A-infinity structure. We use Hochschild cohomology show that A-infinity structures on the relevant algebra are classified by two parameters in the ground ring. An Ext-algebra of two sheaves on a Weierstrass cubic curve carries an A-infinity structure of the right sort, and the coefficients $g_2$ and $g_3$ of the curve can be identified with our two parameters. In this way, the Fukaya category of the punctured torus (the "HF-hat" category) embeds into the dg category of perfect complexes on some cubic curve - in fact, a nodal cubic. Is this a hint of a theory mirror to Heegaard Floer cohomology? This is joint work with Yanki Lekili.

Olga Plamenevskaya
Title: Planar open books, monodromy factorization and symplectic fillings
Abstract: A theorem of Wendl says that if a contact structure admits a planar open book $(S, \phi)$, all its Stein fillings arise from factorizations of the {\em given} monodromy $\phi$ as a product of positive Dehn twists. To obtain applications of this result, we develop combinatorial techniques to study positive monodromy factorizations in the planar case. As a corollary, we classify symplectic fillings for all contact structures on L(p,1), and detect non-fillability of certain contact structures on Seifert fibered spaces. (joint with J. Van Horn-Morris.)

Dylan Thurston
Title: Heegaard Floer homology is natural
Abstract: The easiest statement of invariance for Heegaard Floer homology gives an isomorphism class of groups for each 3-manifold. Can this be improved (like ordinary homology) to give an actual group, rather than an isomorphism class? We show that HF homology does associate a group to a based 3-manifold, giving, for instance, an action of the based mapping class group. In the proof, there is one new move on Heegaard diagrams that had not been previously checked.

Shea Vela-Vick
Title: Contact geometry and Heegaard Floer invariants for noncompact 3-manifolds
Abstract: I plan to discuss a method for defining Heegaard Floer invariants for 3-manifolds. The construction is inspired by contact geometry and has several interesting immediate applications to the study of tight contact structures on noncompact 3-manifolds. In this talk, I'll focus on one basic examples and indicate how one defines a contact invariant which can be used to give an alternate proof of James Tripp's classification of tight, minimally twisting contact structures on the open solid torus. This is joint work with John B. Etnyre and Rumen Zarev.

Stefano Vidussi
Title: Refined adjunction inequalities for 4-manifolds with a circle action
Abstract: Given a smooth 4-manifold $M$, there is an estimate on the minimal genus among representatives of a class of $H_2(M)$ in terms of an adjunction inequality involving Seiberg-Witten basic classes.

In spite of the importance of such inequality in various problems (e.g. the solution of Thom Conjecture) it is known that in general such inequality is not sharp. In particular, in 1998, Peter Kronheimer proved that such inequality can be sharpened for $4$-manifolds of the form $S^1 \times N^3$ using the Thurston norm of $N$.

It is not clear how to extend Kronheimer's approach to other classes of manifolds.

Here we discuss how, using an approach that is quite different from Kronheimer's, we can recast and extend such result to 4-manifolds that are circle bundles over a 3-manifold whose fundamental group satisfies certain group-theoretic properties. More specifically, this group must be virtually RFRS; for example in the case of Haken hyperbolic manifolds (with $b_1 >1$) this is a consequence of Dani Wise's program.

The talk is based on joint work with Stefan Friedl.

Liam Watson
Title: Decayed knots and L-spaces
Abstract: This talk introduces the notion of a decayed knot, a property derived from the left-orderability of the fundamental group of the knot. Decayed knots (1) have sufficiently positive surgeries with non-left-orderable fundamental group and (2) admit decayed cables, for sufficiently positive cabling parameters. This behaviour closely mirrors the behaviour of L-space surgeries on knots in the

three-sphere. Indeed, known examples of decayed knots are L-spaces knots. This is joint work with Adam Clay.

Katrin Wehrheim
Title: Quilted Floer homology - transversality and applications
Abstract: I can briefly state a new, improved, and actually proven transversality for quilted Floer homology.
From there, I can explain two recent applications:
a) SU(n) invariants for 3-manifolds with a homotopy class of maps to S^1; which use a version of Cerf theory for Morse functions to S^1 with connected fibers.
b) calculation of Floer homology for the Chekanov-Polterovich torus in S^2\times S^2; which uses strip shrinking for immersed geometric composition and a weak removal of singularity for figure eight bubbles.

# A classification of numerical Campedelli surfaces

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Abstract
In order to classify complex surfaces of general type with $p_g = 0$ and $K_2 = 2$ (Such surfaces are usually called numerical Campedelli surfaces), it seems to be natural to classify them first up to their topological types. It has been known by M. Reid and G. Xiao that the algebraic fundamental group $\pi_{alg}$ of a numerical Campedelli surface is a finite group of order ≤ 9. Furthermore the topological 1 fundamental groups $\pi_1$ for any numerical Campedelli surfaces are also of order ≤ 9 in as far as they have been determined. Hence it is a natural conjecture that $|\pi_1| \leq 9$ for all numerical Campedelli surfaces.
Conversely one may ask whether every group of order ≤ 9 occurs as the topological fundamental group or as the algebraic fundamental group of a numerical Campedelli surface. It has been proved that the dihedral groups $D_3$ of order 6 or $D_4$ of order 8 cannot be fundamental groups of numerical Campedelli surfaces. Furthermore, it has also been known that all other groups of order ≤ 9, except $D_3$, $D_4$, Z/4Z, Z/6Z, occur as the topological fundamental groups of numerical Campedelli surfaces.
Unlike the case of topological fundamental group, there is also a known numerical Campedelli surface with $H_1$ = Z/6Z (in fact $\pi_{alg}$ = Z/6Z). Therefore all abelian groups of order ≤ 9 except Z/4Z occur
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as the first homology groups (and algebraic fundamental groups) of numerical Campedelli surfaces. Nevertheless, the question on the existence of numerical Campedelli surfaces with a given topological type was completely open for Z/4Z.
Recently Heesang Park, Dongsoo Shin and myself constructed a new minimal complex surface of general type with $p_g = 0$, $K_2 = 2$ and $H_1$ = Z/4Z (in fact $\pi_{alg}$ = Z/4Z) using a rational blow-down
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surgery and a Q-Gorenstein smoothing theory, so that the existence question for numerical Campedelli surfaces with all possible algebraic fundamental groups are settled down. In this talk I'd like to review how to construct such a numerical Campedelli surface.