CIRM Workshop "Stein Manifolds, Contact Structures and Knots"
Monday, September 28 - Thursday, October 1, 2015

PROGRAM

Schedule

	Monday	Tuesday	Wednesday	Thursday
8:45 - 9:45	Hedden	Colin	Murphy	Hedden
10:00 - 11:00	Colin	Murphy	Hedden	Colin
11:00 - 11:20	Coffe break	Coffe break	Coffe break	Coffe break
11:20 - 12:20	Murphy	Hedden	Colin	Murphy
12:30 - 13:30	Lunch	Lunch	Lunch	Lunch
17:30 - 18:15	Ozbagci	Wand	Pinzon	Politarczyk
18:30 - 19:15	Lecuona	Celoria	Golla	Borodzik
19:30	Dinner	Dinner	Dinner	Dinner

Titles and abstracts

Lectures

- **Vincent Colin:** Open book decompositions and Floer type homologies

  Abstract: In dimension three, in a joint work with Paolo Ghiggini and Ko Honda, we use an open book decomposition adapted to a contact structure to show that its embedded contact homology is isomorphic to Heegaard-Floer homology of the ambient manifold. I will describe an attempt (joint with Ko Honda) to extend these ideas and homologies to contact manifolds of higher dimensions. In particular, this leads to a reformulation of Symplectic Khovanov homology of a link in terms of a Heegaard-Floer type homology of a five-dimensional contact manifold.

- **Matt Hedden:** Knot theory, complex curves, and Heegaard Floer homology

  Abstract: I'll discuss the interaction between knot theory in 3-manifolds and complex curves in (the simplest) Stein domains. I'll then introduce Heegaard Floer invariants for 3-manifolds, knots, and contact structures, and talk about connections between these invariants and the aforementioned knot theory of complex curves. Time permitting, this will lead us naturally to consider refined invariants for transverse and Legendrian knots.

- **Emmy Murphy:** Existence of contact structures and overtwistedness in all dimensions

  Abstract: In this lecture series, we prove that any almost contact structure on a manifold is realized as a genuine contact structure. We will also define overtwistedness, and show that overtwisted contact structures are classified by their almost contact homotopy type. We begin with a proof in the 3-dimensional case, which is the easy case. To generalize to higher dimensions, we will study at length the relationship between the geometry of contact germs on codimension 1 spheres, and the contactomorphism group of the disk with its Eliashberg-Polterovich ordering. We will also explore some applications of the main theorems, and briefly discuss further developments in the theory. These lectures are mostly based on the similarly titled paper with Borman and Eliashberg.

Talks

- **Maciej Borodzik:** Heegaard Floer homologies and rational cuspidal curves

  Abstract: We will explain how d-invariants of Ozsváth and Szabó can be used to obstruct the existence of a configuration of cuspidal singularities on a rational cuspidal curve in $\mathbb{CP}^2$. Generalizations apply for higher genera and different algebraic surfaces with geometric genus 0.

- **Daniele Celoria:** Grid homology in lens spaces: coefficients and computations

  Abstract: We are going to introduce grid homology for links in lens spaces as defined by Baker-Grigsby-Hedden, and show how to combinatorially enhance the coefficients to $\mathbb{Z}$. After presenting some programs used to compute these groups, we provide partial evidence for the absence of torsion. If time allows, we will discuss some applications of the theory.

- **Marco Golla:** Dehn surgery and rational homology balls

  Abstract: In this talk I will address the question of which Dehn surgeries along knots in the 3-sphere bound rational homology balls. I will discuss obstructions coming from correction terms in Heegaard Floer homology. In the case of integral surgeries on torus knots, manipulation of plumbings will provide many examples. This is joint work with Paolo Aceto.

- **Ana Lecuona:** Splice links and colored signatures

  Abstract: The splice of two links is an operation defined by Eisenbund and Neumann that generalizes several other operations on links, such as the connected sum, the cabling or the disjoint union. There has been much interest to understand the behavior of different link invariants under the splice operation (genus, fiberability, Conway polynomial, Heegaard-Floer homology among others) and the goal of this talk is to present a formula relating the colored signature of the splice of two oriented links to the colored signatures of its two constituent links. As an immediate consequence, we have that the conventional univariate Levine-Tristram signature of a splice depends, in general, on the colored (or multivariate) signatures of the summands. This is a joint work with Alex Degtyarev and Vincent Florens.

- **Burak Özbağcı:** Contact open books with exotic pages

  Abstract: We consider a fixed contact 3-manifold that admits infinitely many compact Stein fillings which are all homeomorphic but pairwise non-diffeomorphic. Each of these fillings gives rise to a closed contact 5-manifold described as a contact open book whose page is the filling at hand and whose monodromy is the identity symplectomorphism. We show that the resulting infinitely many contact 5-manifolds are all diffeomorphic but pairwise non-contactomorphic. Moreover, we explicitly determine these contact 5-manifolds. (This is a joint work with Otto van-Koert)

- **Juanita Pinzon:** Trisections, braids and two–fold covers of S^4

  Abstract: Inspired by the work of Gay and Kirby on trisections of four-manifolds and the concept of bridge splittings of links in the three-sphere, Meier and Zupan introduced bridge trisections of knotted surfaces in the four-sphere. Using this description of knotted surfaces it is then very easy to obtain a trisection for two-fold branched covers of S^4. Also, Furuta and Ohta defined an invariant of a homology $S^1 \times S^3$ as an analogue to Casson's and to Rokhlin's invariants. In the talk I will present examples of two-component 2-links whose 2-fold covers are homology $S^1 \times S^3$'s and investigate the possibilities of computing their Furuta-Ohta invariants.

- **Wojciech Politarczyk:** Equivariant Khovanov homology

  Abstract: We will present a construction of a variant of Khovanov homology, defined for a periodic link L, which is an analog of the Borel cohomology. We will describe several important properties of this homology theory and derive a new periodicity criterion in terms of the Jones polynomial.

- **Andrew Wand:** Tightness and open book decompositions

  Abstract: We will discuss the problem of characterizing tightness of a contact 3-manifold in terms of supporting open book decompositions, some applications, and generalizations.