

# Workshop: Gauge Theory and Low Dimensional Topology

Events for:  
Monday, April 24 - Friday, April 28

## Monday, April 24th

10:30am **Registration - SCGP Cafe**

11:00am **Daniel Ruberman - SCGP 102**

**Title:** Heegaard Floer invariants in codimension one

**Abstract:** Using Heegaard Floer homology, we construct a numerical invariant for any smooth, oriented 4-manifold  $X$  with the homology of a product of circle and 3-sphere. Specifically, we show that for any smoothly embedded, non-separating 3-manifold  $Y$ , a suitable version of the Heegaard Floer  $d$  invariant of  $Y$ , defined using twisted coefficients, is a diffeomorphism invariant of  $X$ . We show how this invariant can be used to obstruct embeddings of certain types of 3-manifolds. This is joint work with Adam Levine.

12:00pm **Lunch - SCGP Cafe**

2:00pm **Matt Stoffregen - SCGP 102**

**Title:**  $\text{Pin}(2)$ -equivariant Floer homology and the homology cobordism group

3:15pm **Tea - SCGP Lobby**

3:45pm **Paul Feehan - SCGP 102**

**Title:**  $\text{SO}(3)$  monopoles and relations between Donaldson and Seiberg-Witten invariants

**Abstract:**

## Tuesday, April 25th

9:30am **Jake Rasmussen - SCGP 102**

**Title:** Heegaard Floer homology of manifolds with torus boundary

**Abstract:**

10:30am **Coffee Break - SCGP Cafe**

11:00am **Henry Horton - SCGP 102**

**Title:** A Symplectic Instanton Homology via Traceless Character Varieties

12:00pm **Lunch - SCGP Cafe**

2:00pm **SCGP Weekly Talk: Hiraku Nakajima (Colloquim) - SCGP 102**

**Title:** Coulomb branches of 4d  $N=2$  SUSY gauge theories for  $\mathbb{R}^3 \times S^1$

3:15pm **Tea - SCGP Lobby**

3:45pm **Problem session (Chaired by Simon Donaldson) - SCGP 102**

**Wednesday, April 26th**

10:00am **Sergei Gukov - SCGP 102**

**Title:** What categorification of knot and 3-manifold invariants can tell us about 4-manifolds

11:00am **Coffee Break - SCGP Cafe**

11:30am **Mikhaylov Victor - SCGP 102**

**Title:** Teichmuller TQFT and a Conjecture for Kapustin-Witten Equations

12:30pm **Lunch - SCGP Cafe**

2:30pm **Gregory Moore - SCGP 102**

**Title:** The  $S^2$ -Plane Integral As A Tool In The Theory Of Four-Manifolds

**Abstract:** This talk should be viewed as the final part of a lecture series I recently gave at the SCGP on the physical approach to the theory of four-manifold invariants. The first three lectures can be viewed on the SCGP video portal [http://scgp.stonybrook.edu/video\\_portal/](http://scgp.stonybrook.edu/video_portal/) In addition, lecture notes can be found on my home page <http://www.physics.rutgers.edu/~gmoore/SCGP-FourManifoldsNotes-2017.pdf> I will assume some passing familiarity with that material, but I will review the essential points in the physical derivation of the Witten conjecture relating Donaldson and Seiberg-Witten invariants. Then I will continue to review work from about 20 years ago: I will sketch the analog of the Witten conjecture for Donaldson invariants associated to any compact simple Lie group. I will also outline the physical reasoning that led to the notion of "superconformal simple type." Finally, time permitting, I will briefly sketch some ideas that might lead to future progress in this field.

3:30pm **Tea - SCGP Lobby**

5:30pm **WS Banquet**

**Thursday, April 27th**

10:00am **Kenji Fukaya - SCGP 102**

**Title:** A candidate for symplectic side of Atiyah-Floer Conjecture

11:00am **Coffee Break - SCGP Cafe**

11:30am **Daemi Aliakbar - SCGP 102**

**Title:** Admissible Bundles and Atiyah-Floer Conjecture

12:30pm **Lunch - SCGP Cafe**

2:15pm **David Duncan - SCGP 102**

**Title:** From instantons to holomorphic curves

3:15pm **Tea - SCGP Lobby**

3:45pm **Guillem Cazassus - SCGP 102**

**Title:** Towards extended Floer Field theories

**Friday, April 28th**

9:00am **Francesco Lin - SCGP 102**

**Title:** Bar Natan's deformation of Khovanov homology and involutive monopole Floer homology

**Abstract:** We study the conjugation involution in Seiberg-Witten theory in the context of the Ozsvath-Szabo and Bloom's spectral sequence for the branched double cover of a link  $L$  in  $S^3$ . We show that there exists a spectral sequence of  $F[Q]/Q^2$ -modules (where  $Q$  has degree  $\geq 1$ ) which converges to an involutive version of the monopole Floer homology of the branched double cover, and whose  $E^2$ -page is a version of Bar Natan's deformation of Khovanov homology in characteristic two of the mirror of  $L$ . We conjecture that an analogous result holds in the setting of  $\text{Pin}(2)$ -monopole Floer homology.

10:00am **Coffee Break - SCGP Cafe**

10:30am **Paul Kirk - SCGP 102**

**Title:** Traceless  $SU(2)$  character varieties of tangles in 3-manifolds

**Abstract:** I'll discuss symplectic/lagrangian properties of the traceless  $SU(2)$  character varieties of punctured 2-spheres and tangles in 3-manifolds with 2-sphere boundary, with an emphasis on 4-punctured 2-spheres and 2-tangles. I'll outline connections to the singular instanton homology of knots and links.

11:30am **Christopher Scaduto - SCGP 102**

**Title:** The mod 2 cohomology of some  $SU(2)$  representation spaces for a surface

**Abstract:** Consider the space of representations from the fundamental group of a punctured surface to  $SU(2)$  that are  $-1$  around the puncture. We study the 2-torsion in the cohomology of this space. This is a by-product of our investigation into the mod 2 cohomology ring of the space of representations modulo conjugation. This is joint work with Matt Stoffregen.

12:30pm **Lunch - SCGP Cafe**

3:15pm **Tea - SCGP Lobby**