

Workshop on Moduli Spaces of Pseudo-holomorphic Curves II Talk Schedule

Events for:
Monday, June 2nd - Friday, June 6th

Monday, June 2nd

8:00am **Breakfast/registration - SCGP Cafe**

9:00am **Joel Fish - SCGP 102**

Title: Motivating polyfolds I: sc-calculus

Abstract: TBA

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

10:30am **Kenji Fukaya - SCGP 102**

Title: TBA

Abstract: TBA

11:30am **Short Break**

11:45am **Octav Cornea - SCGP 102**

Title: Fukaya category for monotone, cylindrical Lagrangians

Abstract: Lagrangians with cylindrical ends appear in many natural contexts. The simplest examples are curves in the plane that are horizontal at infinity. In more generality, such Lagrangians can be viewed as relators of the Lagrangian submanifolds contained in the fibre of a symplectic or, more generally, a Lefschetz fibration over the disk. To make rigorous the meaning of these relations in terms of modern Floer machinery one option is to define a Fukaya category with objects these cylindrical Lagrangians. Assuming that all Lagrangians involved are monotone, I will describe the technical issues that arise in this construction as well as the approach to this problem as it appears in joint work with Paul Biran (ETH).

12:45pm **Lunch - SCGP Cafe**

2:30pm **Aleksey Zinger - SCGP 102**

Title: Computing Gromov-Witten invariants of hypersurfaces

Abstract: Relating GW-invariants of a projective hypersurface (and more generally of a complete intersection in a toric variety) has been key to establishing "classical" mirror symmetry for GW-invariants of such hypersurfaces. Known as Quantum Lefschetz Hyperplane Principle, it was first suggested by Kontsevich in the genus 0 cases about 20 years ago. I will explain why its obvious extensions fail in positive genus, what happens in genus 1 (established about 10 years) and should happen in higher genus (and likely to be established by J. Niu in genus 2 in the near future).

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

Tuesday, June 3rd

8:00am **Breakfast - SCGP Cafe**

9:00am **Joel Fish - SCGP 102**

Title: Motivating polyfolds II: splicings, retracts, and M-polyfolds

Abstract: TBA

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

10:30am **Bai-Ling Wang - SCGP 102**

Title: L^2 -symplectic vortices and the associated invariants

Abstract: TBA

11:30am **Short Break**

11:45am **Octav Cornea - SCGP 102**

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

4:00pm **John Pardon - SCGP 102**

Title: Hamiltonian Floer homology via implicit atlases

Abstract: I will introduce the notion of an implicit atlas, which is roughly a convenient system of local finite-dimensional reductions. I will then construct implicit atlases on the moduli spaces relevant for Hamiltonian Floer homology. For this, it is particularly important to describe how the atlases on different moduli spaces are related to one another. Finally, I will introduce the "VFC package", which provides tools for defining and working with the virtual fundamental cycle of a space equipped with an implicit atlas. In particular, I will show how to use it to define Hamiltonian Floer homology from the implicit atlases constructed earlier.

Wednesday, June 4th

8:00am **Breakfast - SCGP Cafe**

9:00am **Joel Fish - SCGP 102**

Title: Motivating polyfolds III: polyfolds and local charts in Gromov-Witten

Abstract: TBA

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

10:30am **Chris Woodward - SCGP 102**

Title: Floer trajectories and stabilizing divisors

Abstract: I will talk about a joint project with F. Charest which uses stabilizing divisors to regularize moduli spaces of Floer trajectories with boundary in rational Lagrangians, and, in particular gives a definition of Hamiltonian Floer cohomology for rational symplectic manifolds; the rationality assumption implies that there is a stabilizing divisor which makes the Lagrangian exact in the complement, by results of Borthwick-Paul-Uribe in the K\"ahler case, and Auroux-Gayet-Mohsen, in the rational symplectic case. Although the stabilizing divisor approach has some limitations, it seems useful in situations where one wants to do computations, in particular, the effect of reverse minimal model transitions on Fukaya categories.

11:30am **Short Break**

11:45am **John Pardon - SCGP 102**

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12:45pm **Lunch - SCGP Cafe**

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

Thursday, June 5th

8:00am **Breakfast - SCGP Cafe**

9:00am **Nate Bottman - SCGP 102**

Title: Geometric composition and strip-shrinking

Abstract: In work-in-progress with Katrin Wehrheim, we aim to construct an Aoo-bifunctor $GC: (Fuk(M_0 \times M_1), Fuk(M_1 \times M_2)) \rightarrow Fuk(M_0 \times M_2)$ which sends (L_{01}, L_{12}) to the geometric composition of L_{01} and L_{12} and is defined on morphisms in terms of singular quilts. These singular quilts are the figure eight bubbles which arose as conjectural obstructions in Wehrheim--Woodward's study of strip-shrinking, with the additional decoration of any number of marked points on each of the seams. Toward a Fredholm theory for these singular quilts, we prove a collection of elliptic estimates, two consequences of which are a Gromov compactness theorem for strip-shrinking and a removal of singularity for figure eight bubbles. I will discuss how the strata in the relevant moduli spaces fit together, and state some algebraic consequences of the putative Aoo-bifunctor GC , such as the existence of integral transform-like Aoo-functors between Fukaya categories.

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

10:30am **Bohui Chen - SCGP 102**

Title: Augmented L^2 -symplectic vortices and quantum $[Q, R]=0$

Abstract: TBA

11:30am **Short Break**

11:45am **Nick Sheridan - SCGP 102**

Title: The Fukaya category of a Calabi-Yau manifold relative to a divisor I

Abstract: Hamiltonian Floer cohomology for CY manifolds is comparatively simple to construct - essentially because the relevant pseudo-holomorphic spheres occupy a small subset of the manifold - but Floer cohomology for Maslov-zero Lagrangian submanifolds of a CY manifold is technically hard, because transversality for disc bubbles requires "virtual" techniques. The situation is drastically simpler for exact Lagrangians in an exact complement to a symplectic divisor in a CY manifold, because discs are stabilized by their intersections with the divisor. In this pair of talks, we outline the construction of a version of the Fukaya category based on Lagrangians of this type. While disadvantageous for applications to symplectic topology, we believe that this relative Fukaya category is the "right" one for homological mirror symmetry, where it carries more information than the absolute Fukaya category. The first talk will set the relative Fukaya category in context, and begin to explain the pseudo-holomorphic curve theory that goes into its construction. That explanation will continue in the second talk.

12:45pm **Lunch - SCGP Cafe**

2:30pm **Huijun Fan - SCGP 102**

Title: Constructing the quantum invariants of singularities (FJRW invariants)

Abstract: I will explain my earlier joint work with T. Jarvis and Y. Ruan on constructing the quantum invariants of singularities (FJRW theory) by the analytic technique from symplectic geometry.

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

4:00pm **Mohammed Abouzaid - SCGP 102**

Title: Family Floer cohomology

Abstract: TBA

6:00pm **Workshop Banquet**

Friday, June 6th

8:00am **Breakfast - SCGP Cafe**

9:00am **Chris Wendl - SCGP 102**

Title: Stabilizing divisors in practice

Abstract: Cieliebak and Mohnke defined rational Gromov-Witten invariants by using Donaldson hypersurfaces as auxiliary data to achieve transversality. Their method can also be used in various applications where one would like to remove unwanted words like "semipositive" from statements of theorems. In this talk, I will outline two such applications in symplectic and contact topology: (1) All contact hypersurfaces in a uniruled symplectic manifold separate; (2) Any contact manifold containing a "small" plastikstufe admits no weak symplectic fillings. Both results require a slight extension of the original Donaldson-Auroux estimated transversality theory, provided by a recent result of Mohsen.

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

10:30am **Michael Hutchings - SCGP 102**

Title: Cylindrical contact homology of dynamically convex contact forms in three dimensions

Abstract: I will discuss some joint work with Jo Nelson on the foundations of cylindrical contact homology of dynamically convex contact forms in three dimensions. Index calculations show that there is no problem in defining the differential by counting J-holomorphic cylinders for generic J . In the proof that $d^2=0$, a potential difficulty arises from possible degenerations involving branched covers of trivial cylinders, but intersection theory can be used to rule out the relevant degeneration. The proof of invariance has much worse difficulties. We resolve these using S^1 -dependent almost complex structures similarly to work of Bourgeois-Oancea. We also need to use “obstruction bundle gluing” to deal with certain degenerations involving branched covers of trivial cylinders. The proof of invariance in fact shows that cylindrical contact homology of dynamically convex contact forms lifts to an invariant with integer coefficients, which can be described directly in terms of J-holomorphic curves for a generic (S^1 -independent) J , with one exotic term.

11:30am **Short Break**

11:45am **Tim Perutz - SCGP 102**

Title: The Fukaya category of a Calabi-Yau manifold relative to a divisor Π

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