Concluding Conference of Simons Collaboration on Homological Mirror Symmetry: April 25-28, 2023

Events for:
Tuesday, April 25th - Friday, April 28th

Tuesday, April 25th

8:30am **Workshop: Breakfast - SCGP Cafe**

Title: Breakfast

9:30am **Workshop: Maxim Kontsevich - SCGP 103/ZOOM**

Speaker: Maxim Kontsevich

Title: Motives beyond geometry

Abstract: I'll review the growing body of evidence against the Hodge/Tate conjecture, speculate about the "life after" its potential failure, and recall my old refutation proposal based on tropical geometry.

10:45am **Workshop: Dmitry Kaledin - SCGP 103**

Speaker: Dmitry Kaledin

Title: Enhancements for categories

Abstract: I am going to review existing technologies for working with homotopically enhanced categories, with special emphasis on enhancement based on derivators.

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

Title: Lunch

1:45pm **Workshop: Bertrand Toen - SCGP 103**

Speaker: Bertrand Toen

Title: Integrability of derived foliations in non-zero characteristic.

Abstract: (joint with Vezzosi) In this talk, I will recall the notion of derived foliations and various integrability (formal, analytic, algebraic) results in characteristic zero. These results fail in non-zero characteristic, and I will present a more restrictive notion of "infinitesimal derived foliations" for which some of these integrability results hold in any characteristic.

3:00pm **Workshop: Marina Logares - SCGP 103**

Speaker: Marina Logares

Title: Singular Higgs bundles

Abstract: Higgs bundles are well known to be in core of the Topological Mirror Symmetry and the Geometric Langlands Correspondence through their role in the non-abelian Hodge correspondence and their properties as integrable systems. In this talk I shall give an overview of the geometry and applications of their singular counterparts (e.g. parabolic Higgs bundles, meromorphic Higgs bundlesr

4:00pm **Workshop: Tea Time - SCGP Cafe**

Title: Tea Time

4:45pm **Workshop: Sergei Gukov - SCGP 103/ZOOM**

Speaker: Sergei Gukov

Title: Machine learning and hard problems in mathematics

Abstract: Considering the special occasion and to diversify the list of topics, in this talk, intended for a broad audience, I decided to turn to something that hopefully can be fun and entertaining: While the "state-of-the-art" machine learning algorithms already make an impact at the level of high school or undergraduate curriculum, in this talk I want to explore whether they can help us with some of the most difficult mathematical challenges, at the cutting edge of the mathematical research. No prior familiarity with machine learning is required; rather, one of the goals of this talk is to provide a gentle introduction to some of the modern tools in this subject, in part explaining its rapidly increasing role in everyday life and, hopefully, in pure mathematics as well.

Wednesday, April 26th

8:30am **Workshop: Breakfast - SCGP Cafe**

Title: Breakfast

9:30am **Workshop: Shing-Tung Yau (Li-Sheng Zeng) - SCGP 103/ZOOM**

Speaker: Shing-Tung Yau

Title: Canonical Hermitian Metrics and Non-Kahler Calabi-Yau Threefolds

Abstract: A conifold transition is a process which degenerates 2-cycles and introduces new 3-cycles. We will investigate the web of Calabi-Yau threefolds connected by conifold transitions. Early studies on conifold transitions includes works of Reid and Friedman in the algebraic geometry literature, and Candelas-de la Ossa and Candelas-Green-Hubsch in the physics literature. A conifold transition may connect a Kahler Calabi-Yau to a non-Kahler complex manifold with trivial canonical bundle. There is a also a reverse conifold transition which may produce a non-Kahler symplectic manifold. In this talk, we will discuss the geometrization of these spaces by canonical metrics.

10:45am **Workshop: Zoom discussion - SCGP 103/ZOOM**

Title: zoom discussion

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

Title: Lunch

1:45pm **Workshop: Daniel Halpern-Leistner - SCGP 103**

Speaker: Daniel Halpern-Leistner

Title: The noncommutative minimal model program

Abstract: There are many situations in which the derived category of coherent sheaves on a smooth projective variety admits a semiorthogonal decomposition that reflects something interesting about its geometry. I will present a new unifying framework for studying these semiorthogonal decompositions using Bridgeland stability conditions. Then, I will formulate some conjectures about canonical flows on the space of stability conditions that imply several important conjectures on the structure of derived categories, such as the D-equivalence conjecture and Dubrovin's conjecture.

3:00pm **Workshop: Tobias Dyckerhoff - SCGP 103**

Speaker: Tobias Dyckerhoff

Title: Complexes of stable ?-categories

Abstract: Derived categories have come to play a decisive role in a wide range of topics. Several recent developments, in particular in the context of topological Fukaya categories, arouse the desire to study not just single categories, but rather complexes of categories. In this talk, we will discuss examples that arise in the vicinity of homological mirror symmetry, along with some results and conjectures involving them.

4:00pm **Workshop: Tea Time - SCGP Cafe**

Title: Tea Time

4:45pm **Workshop: Yuri Tschinkel - SCGP 103**

Speaker: Yuri Tschinkel

Title: Equivariant birational geometry

Abstract: I will discuss new constructions in equivariant birational geometry, with special regard to cubic fourfolds (joint with Hassett, Kresch, Boehning and von Bothmer).

5:45pm **Workshop: Social Hour - SCGP Lobby**

Title: Social Hour/Cash Bar

6:30pm **Workshop: Dinner - SCGP Cafe**

Title: Dinner

Thursday, April 27th

8:15am **Workshop: Breakfast - SCGP Cafe**

Title: Breakfast

9:15am **Workshop: Paul Seidel - SCGP 103**

Speaker: Paul Seidel

Title: The quantum connection for Fano manifolds, exponential type, and the spectrum

Abstract: I will explain some recent progress on the structure of the quantum connection,using Fukaya categories, and what we could hope to learn in addition to that. (By "hope" Imean: maybe people at the conference who know more about D-modules than myself might help me out in my puzzlement!). This is joint work with Dan Pomerleano.

10:30am **Workshop: Gabriele Vezzosi - SCGP 103**

Speaker: Gabriele Vezzosi

Title: Analogs of the Beilinson-Drinfeld Grassmannian on a surface

Abstract: TBA

11:45am **Workshop: Phillip Griffiths - SCGP 103**

Speaker: Phillip Griffiths

Title: Hodge theory and moduli

Abstract: Hodge theory provides a major tool for the study of moduli. Conversely, moduli have furnished a significant stimulus for the developement of Hodge theory. This talk will center around the questions • Q1 Torelli: To what extent does the Hodge structure on the cohomology H*(X) determine a smooth projective variety X? Better yet: How can one reconstruct X from Hodge theortic data associated to it? • Q2: To what extent does the structure of a completed image of the period mapping reflect the structure of a completed moduli space M? One knows a lot about how Hodge structures degenerate; can this be used to help understand the boundary M\M of moduli spaces?

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

Title: Lunch

2:00pm **Workshop: Simon Donaldson - SCGP 103**

Speaker: Simon Donaldson

Title: K3 fibrations and adiabatic limits of calibrated submanifolds

Abstract: In the first part of the talk I will review work with Chris Scaduto (arxiv 2004.0731) in which we proposed a model for certain associative submanifolds in fibred G2 manifolds. These submanifolds are, roughly speaking, fibred by holomorphic spheres. I will mention connections with related constructions in the Calabi-Yau literature. In the last part of the talk I will discuss possible extensions to submanifolds fibred by surfaces of higher genus.

3:15pm **Workshop: Chiu-Chu Melissa Liu - SCGP 103**

Speaker: Chiu-Chu Melissa Liu

Title: Gauged linear sigma models and open/closed correspondence

Abstract: TBA

4:15pm **Workshop: Tea Time - SCGP Cafe**

Title: Tea Time

4:45pm **Workshop: Yan Soibelman - SCGP 103/ZOOM**

Speaker: Yan Soibelman

Title: Holomorphic Floer Theory and Chern-Simons theory.

Abstract: Holomorphic Floer Theory (HFT for short) is a project (or rather a program) we have been working on with Maxim Kontsevich for almost 10 years. It is related to several areas of mathematics and physics which are quite distant from symplectic topology. HFT gives a conceptual and unifying perspective on such topics as Riemann-Hilbert correspondence, periodic monopoles, count of saddle connections and resurgence of many generating series in geometry and physics.In this talk, which is a part of our project, I will explain how the ideas of HFT can be used to make a non-trivial predictions in Chern-Simons theory. In particular, if time permits, I will explain a hypothetical Hodge structure of infinite rank which is"responsible" for resurgence of perturbative expansions in complexified Chern-Simons theory

Friday, April 28th

8:30am **Workshop: Breakfast - SCGP Cafe**

Title: Breakfast

9:30am **Workshop: Kenji Fukaya - SCGP 103**

Speaker: Kenji Fukaya

Title: Homological Mirror symmetry of the cotangent bundle revisited.

Abstract: TBA

10:45am **Workshop: Duiliu-Emanuel Diaconescu - SCGP 103/ZOOM**

Speaker: Duiliu-Emanuel Diaconescu

Title: Flops and Hilbert scheme of space curve singularities

Abstract: This is joint work with Mauro Porta, Francesco Sala and Arian Vosoughinia using pagoda flop transitions in order to derive explicit results for topological invariants of Hilbert schemes of space curve singularities.

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

Title: Lunch

1:45pm **Workshop: Clark Barwick - SCGP 103**

Speaker: Clark Barwick

Title: Factorization algebras over the Fargues-Fontaine curve

Abstract: TBA