Titles and Abstracts

Thomas Blomme

Title: Enumerative invariants of some ruled surfaces

Abstract: Ruled surfaces are P1-bundles over some base curve. In case the base is of genus 0, these are known as Hirzebruch surfaces, which are some specific toric surfaces and arise as the projective completion of a line bundle. In case the base is of genus 1, this is not the case anymore. In this talk, we will try to use tropical methods to tackle curve enumeration problems in these surfaces and prove some regularity results like polynomiality or quasi-modularity.

Alexandr Buryak

Title: Counting meromorphic differentials on the Riemann sphere as a Gromov--Witten type theory

Abstract: Counting maps between Riemann surfaces is a classical problem in algebraic geometry and combinatorics, and it was studied for more than one hundred years. In recent years, a related problem of counting meromorphic differentials on Riemann surfaces attracted considerable interest. In the case of the Riemann sphere, I will show WDVV type equations for these enumerative invariants, a relation with the KP hierarchy, and beautiful explicit formulas for them. This is based on our recent joint work with Paolo Rossi.

Xujia Chen

Title: Kontsevich’s invariants as topological invariants of configuration space bundles

Abstract: Kontsevich's invariants (also called configuration space integrals) are invariants for framed smooth manifolds/fiber bundles. The result of Watanabe(’18) showed that Kontsevich’s invariants can distinguish smooth fiber bundles that are isomorphic as topological fiber bundles. I will first give an introduction to Kontsevich's invariants, and state the theorem which provides a perspective on how to understand their ability of detecting exotic smooth structures: real blow up operations essentially depends on the smooth structure, and thus given a space/bundle X, the topological invariants of some spaces/bundles obtained by doing some real blow-ups on X can be different for different smooth structures on X.

Loosely inspired by the definition of Kontsevich's invariants, I will then state a speculative idea regarding defining open Gromov-Witten invariants for positive-genus curves, on manifolds of dimension greater than 3.

Tobias Ekholm

Title: Recursion for skein valued curve counts and skein relations for intersecting Lagrangians

Abstract: We discuss recursions for skein valued counts of holomorphic curves around one basic annulus and show how this leads to new skein modules for intersecting Lagrangians. These new skein modules have the property that any relation in them gives a recursion relation for the skein valued invariant of the intersecting Lagrangians moved apart.

Sergey Finashin

Title: On wall-crossing invariance of certain sums of Welschinger numbers

Abstract: We (in a joint work with V.Kharlamov) continue our quest for real enumerative invariants not sensitive to changing the real structure on a real algebraic variety.
The varieties to be considered now are del Pezzo surfaces X of degrees 1,2,3, and the invariants N_d count (with certain signs) rational curves on X of anti-canonical degree d. The corresponding signs are some modifications of the Welschinger weights which involves a certain canonical Pin-structures on the real locus of X.

Amanda Hirschi

Title: Global Kuranishi charts for closed GW theory

Abstract: I will describe the construction of a global Kuranishi chart for the moduli space of closed stable pseudoholomorphic curves and show how this gives us Gromov–Witten invariants in a straightforward way. To illustrate the flexibility and usefulness of the construction, I will sketch the proof of a product formula and how this strategy can be applied to prove that the invariants satisfy the Kontsevich–Manin axioms. This is joint work with Mohan Swaminathan.

Kai Hugtenburg

Title: Open Gromov-Witten invariants from the Fukaya category

Abstract: In this talk I will propose a framework to show that the Fukaya category of a symplectic manifold determines the open Gromov-Witten invariants of certain Lagrangians. This is done by constructing ‘relative cyclic homology’ and the ‘relative Getzler-Gauss-Manin connection’, which are invariants associated to an object in an A infinity category extending the usual notions. When applied to the Fukaya category, these are isomorphic to the relative quantum cohomology with the relative connection constructed by Solomon-Tukachinsky. I will then show that this data is enough to recover certain open Gromov-Witten invariants of unobstructed and null-homologous Lagrangians in Calabi-Yau manifolds.

Andrés Jaramillo Puentes

Title: Tropical Methods in $\mathbb{A}^1$-Enumerative Geometry

Abstract: Motivic homotopy theory allows us to tie together the results from classical and real enumerative geometry, and yield invariant counts of solutions to geometric questions over an arbitrary field k. The enumerative counts are valued in the Grothendieck-Witt ring GW(k) of non-degenerate quadratic forms over k and we call it quadratic enrichment.

In this talk, I will detail some examples of these counts and I will present a quadratically enriched version of the Bernstein–Khovanskii–Kushnirenko theorem, as well as a quadratically enriched version of the Correspondence Theorem for counting curves passing through configurations of k-rational points.

Jesse Leo Kass

Title: What is the limit of a line bundle on a surface?

Abstract: The compactified Jacobian, or moduli space of line bundles and their degenerations, of a singular curve have been the subject of decades of research that has yielded proofs of important results on curve counting such as Beauville's proof of the Yau–Zaslow formula. In contrast, almost nothing is known about the compactified Picard scheme of a surface even though this moduli space was constructed in 1979 (four decades ago).

In my talk, I will describe the geometry of the compactified Picard scheme in the important case of a surface with double crossing and pinch point singularities. Time permitting, I will talk about connections with autoduality and work of R. Hartshorne and C. Polini on divisor class groups.

Or Kedar

Title: The Fukaya A-infinity algebra of a non-orientable Lagrangian

Abstract: Fukaya A-infinity algebras play a fundamental role in open Gromov-Witten theory. However, a definition for non-orientable Lagangian submanifolds has appeared to be elusive. The main issue is the emergence of odd Maslov indices. I will demonstrate how this raises both geometric and algebraic obstacles. Examining these obstacles surfaces a new tool, which we call orientors, that systematizes orientation calculus along submersions. A careful manipulation brings the obstacles to cancel each other, and thus gives rise to a model of the A-infinity algebra based on differential forms with values in a local system of graded non-commutative Novikov rings.

Marc Levine

Title: An introduction to enumerative geometry and its quadratic refinement

Abstract: This will be an overview lecture for non-experts. We will discuss some basic problems in classical enumerative geometry and introduce some of the algebraic tools and methods that have been developed to solve them, including the Chow ring, intersection theory on Grassmannians, Chern classes and degree maps. We will then give some ideas of how these can be refined to deliver interesting invariants in the Grothendieck-Witt ring of quadratic forms, refining the integer-valued invariants given by the classical theory via the rank map, and yielding some of the enumerative invariants found in real algebraic geometry by taking the signature.

Grigory Mikhalkin

Title: Tropical planimetry and Hamiltonian isotopies

Abstract: We survey various toric constructions in symplectic geometry based on studies of geometry of tropical polygons. Geometric structure in the plane allows one to measure distances within lines of rational slope, as well as angles between such lines in a way, invariant with respect to the action of all invertible integral linear transformations and real translations. A very recent application of tropical planimetry produces pairs of symplectomorphic, but not Hamiltonian isotopic Lagrangian tori in S2xS2, this is a joint work with Richard Hind and Felix Schlenk.

Johannes Rau

Title: Patchworks of real algebraic varieties close to a smooth tropical limit

Abstract: Joint work with Kris Shaw (Oslo) and Arthur Renaudineau (Lille). In an attempt to study Viro's combinatorial patchworking method in higher codimensions, we introduce the concept of real phase structures on polyhedral complexes and construct so-called patchworks associated to them. We discuss some general properties of these patchworks and their relationship with real algebraic varieties "close to a smooth tropical limit".

May Sela

Title: Open Gromov-Witten invariants of the Chiang Lagrangian

Abstract: Many computations of open Gromov-Witten invariants are known for Lagrangian submanifolds fixed by an anti-symplectic involution. I will discuss a computation of these invariants for the Chiang Lagrangian, which is a Lagrangain submanifold in CP^3 that is not fixed by an anti-symplectic involution. Then, I will survey some observations concerning this

computation such as non-monotonicity of the invariants with degree, periodicity of the sign, and non-integrality. In addition, I will present the computation of the small relative quantum cohomology. This is a joint work with A. Hollands, E. Kosloff, Q. Shu, and J. Solomon.

Eugenii Shustin

Title: Enumeration of real oriented curves and refined tropical invariants

Abstract: Mikhalkin (2017) proved the existence of real rational enumerative invariants of the plane refined with respect to the quantum index and related them to refined tropical invariants of Block-Göttsche type. We extend these invariants to genus one and two and show that the corresponding refined tropical invariants essentially differ from the Block-Göttsche ones. In higher genera there are no similar real algebraic invariants, but there exists a series of refined tropical invariants for any degree and genus. We also discuss relations to the quantum tropical vertex. Joint work with I.Itenberg.

Ran Tessler

Title: New open r-spin theories

Abstract:
In his 92' work, Witten has defined the r-spin intersection theory. This theory have found an open counterpart, in genus 0, in a recent joint work with Buryak and Clader (BCT). In the closed and open setting there are (internal) marked points, which are allowed to carry any twist from the set 0,1,...,r-1, and in the BCT open setting there are also boundary markings whose twist is restricted to be r-2.

My talk will describe a new construction of genus=0 open r-spin theories, which allows different collections of boundary states, as well as the relations satisfied by the resulting intersection numbers. If time permits I will also say a few words relations with other models. Based on a joint work with Yizhen Zhao.

Oleg Viro

Title: Patchworking

Abstract: I will explain the original meanings of the words which are used now in various meanings.