East Asian Symplectic Conference 2015
HONG KONG

November 2 - 6, 2015
The Chinese University of Hong Kong

November 2, Monday

Morning Sessions at Yasumoto International Academic Park - YIA LT2
09:45 - 10:45 Registration
11:00 - 12:00 Huai-Liang Chang (Hong Kong University of Science and Technology)
    Mixed-Spin-P field moduli and its virtual fundamental class

Afternoon Sessions at Yasumoto International Academic Park - YIA LT2
13:45 - 14:45 Huijun Fan (Peking University)
    Analytic theory of gauged linear sigma model
15:00 - 16:00 Hiroshi Iritani (Kyoto University)
    Global mirror symmetry for toric stacks and its application
16:30 - 17:30 Miles Reid (University of Warwick and KIAS)
    Ice cream and orbifold Riemann-Roch

November 3, Tuesday

Morning Sessions at Yasumoto International Academic Park - YIA LT2
11:00 - 12:00 Viktor Ginzburg (University of California, Santa Cruz)
    Non-contractible periodic orbits in Hamiltonian dynamics on closed symplectic
    manifolds

Afternoon Sessions at Yasumoto International Academic Park - YIA LT2
13:45 - 14:45 Suguru Ishikawa (Kyoto University, RIMS)
    Spectral invariants of distance functions
15:00 - 16:00 Ching-Hao Chang (Academia Sinica)
    The isotopy problems of nodal symplectic spheres and J-holomorphic spheres in
    rational manifolds
16:30 - 17:30 Byeongho Lee (National Institute for Mathematical Sciences)
    Orbifolding Frobenius manifolds

November 4, Wednesday

Morning Sessions at Yasumoto International Academic Park - YIA LT3
09:45 - 10:45 Yong-Geun Oh (IBS Center for Geometry and Physics)
    Topological extension of Calabi invariants and its application
11:00 - 12:00 Fumihiko Sanda (Kyoto University)
    Computations of quantum cohomology from Fukaya categories

Afternoon Free Discussion

November 5, Thursday

Morning Sessions at William M.W. Mong Engineering Building - ERB LT
11:00 - 12:00 Chung-I Ho (National Tsing Hua University)
        Minimal genus problems in 4-manifolds

Afternoon Sessions at University Science Centre - SC L1
13:45 - 14:45 Chris Wendl (University College London)
        Tight contact structures on connected sums need not be contact connected sums
15:00 - 16:00 Bohui Chen (Sichuan University)
        Quantization of Kirwan morphism
16:30 - 17:30 Toru Yoshiyasu (Kyoto University)
        On Lagrangian submanifolds in the complex projective spaces

November 6, Friday

Morning Sessions at Lee Shau Kee Bulding - LSK LT4
11:00 - 12:00 Bohan Fang (Peking University)
        Global mirror curve of a toric Calabi-Yau 3-fold

Afternoon Sessions at Lady Shaw Building - LSB LT5
13:45 - 14:45 Gabriel C. Drummond-Cole (IBS Center for Geometry and Physics)
        Chain level string topology operations
15:00 - 16:00 Yohsuke Imagi (Kavli IPMU)
        Simple singualrity of special Lagrangian submanifolds
16:30 - 17:30 Ziming Nikolas Ma (National Taiwan University)
        Scattering in the SYZ programme

Abstracts

Ching-Hao Chang (Academia Sinica)
Title: The isotopy problems of nodal symplectic spheres and J-holomorphic spheres in rational manifolds
Abstract: The isotopy problem for symplectic submanifolds in a symplectic manifold is always a very interesting topic in symplectic topology. One can use various techniques to study the isopoty problems for different categories of symplectic submanifolds in different symplecitc manifolds. For the compact symplectic 4-manifold case, one of the approaches to attack the isotopy problem for the symplectic surfaces in a compact symplectic 4-manifold (M, ω) is to study the isotopies for J-holomorphic curves in (M, ω) where J is an ω-tamed almost complex structure on M. This approach is first introduced by M. Gromov. He (1985) proved that any symplectic sphere of degree 1 in $\mathbb{C}P^2$ is symplectically isotopic to an algebraic line. J. Barraud (1999) extended Gromov's work to show that any symplectic sphere of degree d in $\mathbb{C}P^2$ with only positive ordinary double point singularities is symplectically isotopic to an algebraic curve. In fact, We can imitate Barraud's work and further extend the result to the nodal symplectic spheres in rational manifolds by studying the nodal J-holomorphic spheres in them. In this talk, we will briefly introduce the idea and take a walk in the moduli space of J-holomorphic curves.

Huai-Liang Chang (Hong Kong University of Science and Technology)
Title: Mixed-Spin-P field moduli and its virtual fundamental class
Abstract: Mixed-Spin-P field (MSP field) is a moduli space which contain both objects in GW theory of a projective hypersurface and also FJRW theory of the corresponding cone singularity. It is designed for studying CY-LG correspondence and also enumeration of higher genus GW/FJRW invariants. In this talk we will survey its motivation and current progress.

Bohui Chen (Sichuan University)
Title: Quantization of Kirwan morphism
Abstract: In this talk, I will explain the quantum version of Kirwan morphism using moduli spaces of symplectic vortex and generalized symplectic vortex equations.

Gabriel C. Drummond-Cole (IBS Center for Geometry and Physics)
Title: Chain level string topology operations
Abstract: String topology on a manifold is related to symplectic invariants on the cotangent bundle of that manifold. So far, this relationship has been expressed rigorously as an isomorphism of certain algebraic structures at the level of homology. It is anticipated that the isomorphism is the shadow of a more fundamental equivalence at the level of chain complexes. I will discuss a chain level string topology structure that could be seen as a candidate for one side of this potential equivalence.

Huijun Fan (Peking University)
Title: Analytic theory of gauged linear sigma model
Abstract: GLSM was proposed by Witten to understand the mirror symmetry, including the LG/CY correspondence conjecture. Recently, there are much work on constructing the invariants theory both from algebraic geometry and from analysis. In algebraic geometry, there are the efforts by Fan-Jarvis-Ruan, Chang-Li-Li-Liu and other groups. The quantum invariants in "narrow" case have been built up (under some stability conditions). But the construction of all quantum invariants including "narrow" and "broad" cases has not been completed, and it is a challanging work. This is even a challenging problem for algebraic geometers to construct the FJRW invariants in "broad case". In this talk, I will report the recent progress of the work by Tyler, Ruan and me (since 2012) to construct the invariants by studying the module problem

of the gauged Witten equation. In detail, I will report the context of our first paper in analysis:

1) Basics of Gauged Witten equations;
2) Regularity and compactness theorems;
3) Linear theory;
4) Boundary theory;
5) Asymptotic behavior;
6) Center manifold theorm;
7) Slice theorem;
8) Fredholm theory of the fiber moduli space.

Bohan Fang (Peking University)
Title: Global mirror curve of a toric Calabi-Yau 3-fold
Abstract: I will describe the construction of a family of mirror curves over the secondary toric variety of a toric Calabi-Yau 3-fold. The recent progress of all genus mirror symmetry (BKMP remodeling conjecture) allows us to interpret A-model open-closed Gromov-Witten invariants in terms of the topological recursion on the mirror curve. Thus this construction automatically has implications on the modularity of GW invariants and the crepant resolution conjecture.

Viktor Ginzburg (University of California, Santa Cruz)
Title: Non-contractible periodic orbits in Hamiltonian dynamics on closed symplectic manifolds
Abstract: In this talk, we focus on Hamiltonian diffeomorphisms of closed symplectic manifolds with non-contractible periodic orbits. We will discuss several conjectures and results concerning the existence of such orbits and also some relevant aspects of Floer theory. We will show that, in a variety of settings, the presence of one non-contractible periodic orbit implies the existence of infinitely many such orbits in a specific collection of free homotopy classes. The talk is based on a joint work with Basak Gurel.

Chung-I Ho (National Tsing Hua University)
Title: Minimal genus problems in 4-manifolds.
Abstract: In this talk, I will explain some recent progress in estimating the minimal genus of embedded surfaces in smooth 4-manifolds. In particular, I will give lower bounds which only depends on the homology type rather than the smooth structure.

Yohsuke Imagi (Kavli IPMU)
Title: Simple singualrity of special Lagrangian submanifolds
Abstract: Special Lagrangian submanifolds are volume-minimizing Lagrangian submanifolds of Calabi-Yau manifolds. McLean established in 1990's a local theory on the moduli space of compact special Lagrangian submanifolds, but its global structure has not been well-understood; in other words we have not a good understanding of singularity of special Lagrangian submanifolds. Joyce developed in 2000's a fairly good theory on a simple class of singularity, and I have recently made further progress in that direction. I will talk about it.

Hiroshi Iritani (Kyoto University)
Title: Global mirror symmetry for toric stacks and its application
Abstract: I will describe a partially compactified Landau-Ginzburg model which is mirror to the big quantum cohomology of a toric Deligne-Mumford stack. I will also describe its application to the functoriality of quantum cohomology.

Suguru Ishikawa (Kyoto University, RIMS)
Title: Spectral invariants of distance functions
Abstract: Entov and Polterovich introduced the notion of a (super)heavy subset of a symplectic

manifold by using spectral invariants of Floer homology. Superheavy set cannot displaced by symplectic isotopy, and heavy set cannot be displaced by Hamiltonian isotopy. Important fact is that (super)heavyness is preserved by product, which enabled them a lot of examples of non-displaceable subsets. We found new kind of superheavy set by direct calculations of spectral invariants of distance-like Hamiltonians. We showed if convex open subsets in Euclidian space are disjointly embedded in a spherically negative monotone closed symplectic manifold, their compliment is superheavy. The key of the proof is estimates of the Conley-Zehnder index of periodic orbits of distance-like Hamiltonian.

Byeongho Lee (National Institute for Mathematical Sciences)
Title: Orbifolding Frobenius manifolds
Abstract: Given a Frobenius manifold and a finite group acting on it, it has been speculated that there may be a general procedure to produce a new FM, called orbifolding. Examples of orbifolding at the level of Frobenius algebras appeared in the works of Fantechi-Goettsche, and Kaufmann. In fact, Kaufmann's description of orbifolding A series singularities to get D series essentially solves the problem at the level of FM, since their Frobenius structures can be obtained from their undeformed superpotentials using standard procedures. But we will take a different view point and look directly at their FM structures, so that we can generalize to more general types of FM's that do not have simple descriptions such as superpotentials.

Ziming Nikolas Ma (National Taiwan University)
Title: Scattering in the SYZ programme
Abstract: We consider semi-flat torus bundles X_0 and $\check{X}_0$ over a common base B_0, which is semi-flat limit of a mirror pair of Calabi-Yau manifold X and $\check{X}$. We prove that the process of solving Maurer-Cartan equation in $L^*_{X_0}$, the fiberwise Fourier transform of the Kodaira-Spencer dgLa on $\check{X}_0$, has semi-classical limit as the scattering process introduced by Kontsevich-Soibelman, which is known to govern the deformation from $\check{X}_0$ to $\check{X}$. This is a part of joint work in progress with K.-W. Chan and Conan Leung to carry out Fukaya's program on understanding quantum corrections.

Yong-Geun Oh (IBS Center for Geometry and Physics)
Title: Topological extension of Calabi invariants and its application
Abstract: In this talk, I will explain how we can extend the classical Calabi homomorphism on the area-preserving diffeomorphism group of two-disc to the group of Hamiltonian homeomorphisms. I will also mention implication of this extension result on the structure of area-preserving homeomorphism group of the two-disc.

Miles Reid (University of Warwick)
Title: Ice cream and orbifold Riemann-Roch
Abstract: Ice cream expresses periodicity: if you have income of 3/7 per day, you get an ice cream on Wed, Fri and Sun of each week. The same can be expressed as Dedekind sums, that are defined as trigonometric sums, but better thought of as the Fourier coefficients of a periodic function. An orbifold is an algebraic variety X locally modelled on quotient singularities such as $\mathbb{C}^n/G$ where $G \subset \mathrm{GL}(n, \mathbb{C})$ is a finite subgroup. For my purposes, G is a diagonal cyclic group $\mathbb{Z}/r$ acting on $\mathbb{C}^n$ with only isolated fixed points. Orbifold RR asks for the Euler characteristic $\chi(X, \mathcal{F})$ of a sheaf $\mathcal{F}$ modelled on the character sheaves of G. For a global quotient $X = Y/G$, orbifold RR is the same thing as the holomorphic Lefschetz fixed point formula of Atiyah, Singer and Segal, expressing the character of G acting on the cohomology of an equivariant sheaf as a local property at the fixed points, that in turn works out as Dedekind sums. We use these ideas to give a very simple and practical formula for the Hilbert series of projectively Gorenstein varieties, which includes, for example, the log del Pezzo surfaces, $\mathbb{Q}$-Fano 3-folds or Calabi–Yau

orbifolds that are popular in string theory.

Fumihiko Sanda (Kyoto University)
Title: Computations of quantum cohomology from Fukaya categories
Abstract: In this talk, we explain how to compute quantum cohomology from Fukaya categories. As an application, we compute quantum cohomology of a blow-up of the $\mathbb{P}^2 \times \mathbb{P}^1$ along a elliptic curve.

Chris Wendl (University College London)
Title: Tight contact structures on connected sums need not be contact connected sums
Abstract: In dimension three, convex surface theory implies that every tight contact structure on a connected sum $M \sharp N$ can be constructed as a connected sum of tight contact structures on M and N. I will explain some examples showing that this is not true in any dimension greater than three. The proof is based on a recent higher-dimensional version of a classic result of Eliashberg about the symplectic fillings of contact manifolds obtained by subcritical surgery. This is joint work with Paolo Ghiggini and Klaus Niederkrüger.

Toru Yoshiyasu (Kyoto University)
Title: On Lagrangian submanifolds in the complex projective spaces
Abstract: In 2013, Y. Eliashberg and E. Murphy established the h-principle for exact Lagrangian embeddings with a concave Legendrian boundary. In this talk, I will explain that their h-principle holds for exact Lagrangian embeddings with a concave Legendrian boundary into 6-dimensional compact symplectic manifolds. I will also show its application to the existence of Lagrangian submanifolds in the complex projective spaces.