

# Workshop on mirror symmetry and related topics, Kyoto 2016.

**Dates:** 12 December 2016 – 16 December 2016

**Venue:** Room127 (conference room), Department of Mathematics (Graduate School of Science Bldg no.3), Kyoto University

## Schedule:

	9:00-10:00	10:15–11:15	13:30 – 14:30	14:45 – 15:45	16:00 – 17:00
12 Mon	Hosono	Odaka	Nohara	Tonita	Ono1
13 Tue	free	free	González	Johnson1	Ono2
14 Wed	Coates1	Kodera	free	free	free
15 Thu	Chan	Fang	Johnson2	Coates2	Ike
16 Fri	Oh	Ueda	Sanda	Takahashi	(closing)

- Dinner Meeting (研究交流会): Monday from 18:00, University Cafeteria in the North Campus, 2nd floor (reservation required)
- Banquet: Restaurant Mon, from 18:00 (reservation required)

## Titles (in time order)

Shinobu Hosono	<i>Birational geometry from the moduli spaces of mirror CICYs</i>
Yuji Odaka	<i>Tropical Geometric Compactifications of Moduli spaces</i>
Yuichi Nohara	<i>Lagrangian fibrations on Grassmannians and cluster transformations</i>
Valentin Tonita	<i>K-theoretic mirror formulae</i>
Kaoru Ono	<i>Generation criterion for Fukaya category and related topics</i>
Eduardo González	<i>The quantum Kirwan morphism and abelianisation of quotients</i>
Paul Johnson	TBA (tropical approach to Gromov-Witten theory)
Tom Coates	<i>Mirror Symmetry and Fano Manifolds</i>
Ryosuke Kodera	<i>Quantized Coulomb branches of Jordan quiver gauge theories and cyclotomic rational Cherednik algebras</i>
Kwokwai Chan	<i>Revisiting the open mirror theorem</i>
Bohan Fang	<i>The conifold transition of a torus knot and open Gromov-Witten invariants</i>
Yuichi Ike	<i>Categorical localization for the coherent-constructible correspondence</i>
Jeongseok Oh	<i>Quasimap theory for relative GIT quotients</i>
Kazushi Ueda	<i>Calabi-Yau 3-folds in Grassmannians of exceptional type</i>
Fumihiko Sanda	<i>An analog of the Dubrovin conjecture</i>
Atsushi Takahashi	<i>On entropy of autoequivalences of smooth projective varieties</i>

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Organizers: Hiroshi Iritani, Yukiko Konishi, Atsushi Takahashi

## Abstracts (in alphabetical order)

- **Kwokwai Chan**

Title: Revisiting the open mirror theorem

Abstract: In this talk, I will first review an open analogue of the mirror theorem for toric Calabi-Yau manifolds obtained in joint works with Cho, Lau, Leung and Tseng; this theorem gives an enumerative interpretation for inverse of mirror maps and also an effective computation of disk counting invariants. Then I will explain a recent attempt in understanding this theorem from a different perspective.

- **Tom Coates**

Title: Mirror Symmetry and Fano Manifolds

- **Bohan Fang**

Title: The conifold transition of a torus knot and open Gromov-Witten invariants

Abstract: The large- $N$  duality and the conifold transition of a knot in the 3-sphere produce a Lagrangian submanifold in the resolved conifold. When the knot is a torus knot one can define open invariants w.r.t. this Lagrangian by localization or relative Gromov-Witten theory. I will describe this procedure and the all genus mirror symmetry where the B-model is the topological recursion on the mirror curve. The B-side theory predicts these open invariants. This talk is based on the joint work with Zhengyu Zong.

- **Eduardo González**

Title: The quantum Kirwan morphism and abelianisation of quotients

Abstract: Given a reductive  $G$  and a polarised projective  $G$  variety  $X$  there is a cobordism relating the moduli of stable maps to the GIT quotient  $X//G$  with the moduli stack of gauged maps with target  $X$ . This cobordism is itself a moduli of gauged maps enriched with a scaling. By letting the polarisation go to infinity, we will see that this cobordism can be used to define a morphism from equivariant quantum K-theory (cohomology) of  $X$  to the usual quantum  $K$ -theory (cohomology) of the quotient, which relates the gauged potential of  $X$  with the graph potential of  $X//G$  up to certain quantum corrections appearing as counts of affine gauged maps. We will see how this can be used to understand the relation of potentials for the GIT quotient of  $X//G$  and the GIT quotient  $X//T$  by the maximal torus subgroup of  $G$ . This is joint work with C. Woodward and other parts also with P. Solis.

- **Shinobu Hosono**

Title: Birational geometry from the moduli spaces of mirror CICYs

Abstract: It is known that birational geometry of Calabi-Yau manifolds naturally appears when we describe mirror symmetry. In this talk, I will show some interesting examples which have birational automorphisms of infinite order, and identify them with monodromy (connection) transformations in their mirror families. If time permits, I will mention some observations on Picard-Lefschetz transformations. This talk is based on collaborations with Hiromichi Takagi.

- **Yuichi Ike**

Title: Categorical localization for the coherent-constructible correspondence

Abstract: The coherent-constructible correspondence is a version of homological mirror symmetry for toric varieties. It states that the derived category of coherent sheaves on a complete toric variety is equivalent to that of constructible sheaves on the real torus

whose microsupports are contained in some Lagrangian. Even if the toric variety is not necessarily complete, the category of wrapped constructible sheaves (which was recently introduced by Nadler) is the mirror category in the coherent-constructible correspondence. We prove categorical localization for categories of wrapped constructible sheaves, which can be regarded as a microlocal counterpart of categorical localization for Fukaya categories. This is a joint work with Tatsuki Kuwagaki.

- **Paul Johnson**

Title: TBA (tropical approach to Gromov-Witten theory)

- **Ryosuke Kodera**

Title: Quantized Coulomb branches of Jordan quiver gauge theories and cyclotomic rational Cherednik algebras

Abstract: Braverman-Finkelberg-Nakajima gave a mathematically rigorous definition of the Coulomb branches of  $3d \mathcal{N} = 4$  supersymmetric gauge theories. They are certain Poisson affine algebraic varieties and admit natural quantizations. In this talk we consider the quantized Coulomb branches associated with quiver gauge theories of Jordan type. We prove that they are isomorphic to the spherical parts of cyclotomic rational Cherednik algebras. This is a joint work with Hiraku Nakajima.

- **Yuichi Nohara**

Title: Lagrangian fibrations on Grassmannians and cluster transformations

Abstract: For each triangulation of a convex  $n$ -gon, one can associate a Lagrangian torus fibration on the Grassmannian of 2-planes in an  $n$ -space. In this talk, we discuss a relation between potential functions for the Lagrangian torus fibers and cluster transformations on the Landau-Ginzburg mirror of the Grassmannian.

- **Yuji Odaka**

Title: Tropical Geometric Compactifications of Moduli spaces

- **Jeongseok Oh**

Title: Quasimap theory for relative GIT quotients

Abstract: Ciocan-Fontanine, Kim and Maulik invented a new cohomological field theory for GIT quotient target space which is called quasimap theory. By several evidences, quasimap theory seems to be a suitable counterpart of Gromov-Witten theory in mirror symmetry. For instance, Ciocan-Fontanine and Kim conjectured so called “wall crossing formula conjecture” which describe a relationship between quasimap theory and Gromov-Witten theory and proved it for several interesting target spaces even for any genus. On the other hand, wall crossing formula conjecture has exactly same form as BCOV conjecture. In this sense, we can think quasimap theory as mathematically well-defined B-model theory.

For genus zero case, this behaves more well. In this case, they proved wall crossing formula conjecture for any target space with a suitable torus action. Especially, wall crossing formula recovers Givental’s mirror theorem for toric case. Also, wall crossing formula recovers mirror theorem for flag varieties.

In this talk, I will introduce a new cohomological field theory for relative GIT space which means a fiber bundle over smooth projective varieties with GIT quotient space as fiber. We call it as quasimap theory either. Then, I will explain wall crossing formula for genus zero and for relative GIT with torus action on its fiber. Moreover, I will introduce a twisted theory. Wall crossing formula can be clearly written for relative GIT with toric

variety or flag variety as its fiber. Finally, I will explain why it can be regarded as a mirror theorem by showing that wall crossing formula recovers Brown's theorem for relative GIT with toric variety as its fiber.

- **Kaoru Ono**

Title: Generation criterion for Fukaya category and related topics

- **Fumihiko Sanda**

Title: An analog of the Dubrovin conjecture

Abstract: B. Dubrovin conjectured the equivalence between the semi-simplicity of the quantum cohomology of a Fano manifold and the existence of full exceptional collection in the derived category of coherent sheaves on it. He also conjectured the Stokes matrix of the quantum D-module can be described by the Euler pairings of the full exceptional collection. Recently, this statement is refined as a Gamma conjecture by Galkin-Golyshev-Iritani. In this talk, I will speak about an analog of the Dubrovin conjecture for the case that the quantum cohomology is not necessarily semi-simple. This is a joint work in progress with Y. Shamoto.

- **Atsushi Takahashi**

Title: On entropy of autoequivalences of smooth projective varieties

Abstract: Entropy for endofunctors of triangulated categories is defined by Dmitrov-Haiden-Katzarkov-Kontsevich. Based on the joint work with Kohei Kikuta, the categorical entropy of a surjective endomorphism of a complex smooth projective variety is shown to be equal to its topological entropy, which is done by DHKK under a certain technical condition. It is natural to expect a generalization of the fundamental theorem by Gromov-Yomdin: the entropy of an autoequivalence of a complex smooth projective variety should be given by the logarithm of the spectral radius of the induced automorphism of the numerical Grothendieck group. This conjecture holds for elliptic curves (Kikuta's result) and if the canonical or anti-canonical sheaf is ample.

- **Valentine Tonita**

Title:  $K$ -theoretic mirror formulae

Abstract: I will define permutation-equivariant  $K$ -theoretic Gromov-Witten invariants (introduced by Givental). Roughly speaking "mirror formulae" means that certain  $q$ -hypergeometric series associated to a manifold  $X$  are generating series of these invariants. I will write these series for certain  $X$  (toric, zero sections of convex bundles) and, time permitting, discuss the proofs of such results.

- **Kazushi Ueda**

Title: Calabi-Yau 3-folds in Grassmannians of exceptional types

Abstract: We discuss classification of Calabi-Yau complete intersections defined by equivariant vector bundles on homogeneous spaces of simple Lie groups of exceptional type associated with maximal parabolic subgroups. Only Grassmannians of types  $E_6$  and  $G_2$  have Calabi-Yau complete intersections of dimension 3. Those in  $G_2$ -Grassmannians are deformation-equivalent to the famous Pfaffian-Grassmannian pairs of Calabi-Yau 3-folds. They give rise to a pair of non-compact Calabi-Yau 7-folds, which are related by a flop and are derived equivalent. They also give examples of annihilators of the class of the affine line in the Grothendieck ring of varieties. This is a joint work with Atsushi Ito, Makoto Miura, and Shinnosuke Okawa.