Mirror Symmetry and Algebraic Geometry 2015

Date: 7 – 9 Dec 2015

Place: Conference Room (127), Graduate School of Science Bldg no.3,
Department of Mathematics, Kyoto University.
Tuesday (8 Dec) afternoon talks will take place in the room 110.

	10:00–11:00	11:30–12:30	lunch	14:00–15:00	15:15–16:15	16:30 – 17:30	18:00 –
7 (Mon)	Mochizuki	Werner		Iwaki	Sekiguchi	Kim	
8 (Tue)	Akaho	Hirano		Miura	Nishinou	Cho	banquet
9 (Wed)	Oouchi	Ikeda		Yoshikawa	Okawa	Kanazawa	

7 December

10:00 – 11:00	Takuro Mochizuki	_A Twistor Approach to Kontsevich Complexes_
11:30 – 12:30	Elisabeth Werner	_Orbifold Jacobian Algebras for Invertible Polynomials_
14:00 – 15:00	Kohei Iwaki	_Topological recursion, quantum curves and Painlevé equations_
15:15 – 16:15	Jiro Sekiguchi	_A generalization of WDVV equation and its applications_
16:30 – 17:30	Bumsig Kim	_Mirror Theorem for Elliptic Quasimap Invariants_

8 December

10:00 – 11:00	Manabu Akaho	_Symplectic displacement energy for exact Lagrangian immersions_
11:30 – 12:30	Yuki Hirano	_Equivalences of derived factorization categories of gauged Landau-Ginzburg models_
14:00 – 15:00	Makoto Miura	_Complete intersection Calabi–Yau threefolds in Grassmannians with respect to homogeneous vector bundles_
15:15 – 16:15	Takeo Nishinou	_Degeneration and curves on K3 surfaces_
16:30 – 17:30	Cheol-Hyun Cho	_Constructive mirror functor for punctured Riemann surfaces_

9 December

10:00 – 11:00	Genki Oouchi	_Lagrangian embeddings of cubic fourfolds containing a plane_
11:30 – 12:30	Akishi Ikeda	_Stability conditions on Calabi-Yau completions for formal parameters_
14:00 – 15:00	Ken-Ichi Yoshikawa	_BCOV invariant for Borcea-Voisin threefold_
15:15 – 16:15	Shinnosuke Okawa	_Compact moduli of marked noncommutative cubic surfaces via quivers_
16:30 – 17:30	Atsushi Kanazawa	_A partial compactification of the Hori-Vafa toric mirror symmetry_

Abstracts

- **Manabu Akaho**

  Title: *Symplectic displacement energy for exact Lagrangian immersions*

  Abstract: In this talk, I will explain an inequality of displacement energy for exact Lagrangian immersions. Our approach is based on Floer homology for Lagrangian immersions and Chekanov's homotopy technique of continuations.

- **Cheol-Hyun Cho**

  Title: *Constructive mirror functor for punctured Riemann surfaces*

  Abstract: We propose a non-commutative mirror symmetry formalism. Given a family of Lagrangian submanifold in a symplectic manifold, we use Maurer-Cartan formalism to define the mirror non-commutative quiver algebra, with a central element, such that it comes with a canonical A-infinity functor from Fukaya category of the symplectic manifold to the matrix factorization category of this central element. We illustrate this in the case of punctured Riemann surfaces, recovering Bocklandt's result in a geometric way. This is a joint work with Hansol Hong and Siu-Cheong Lau.

- **Yuki Hirano**

  Title: *Equivalences of derived factorization categories of gauged Landau-Ginzburg models*

  Abstract: Derived factorization categories of gauged Landau-Ginzburg (LG) models are generalizations of bounded derived categories of coherent sheaves on varieties, and are considered as the categories of D-brane of type B for gauged LG models. In this talk, for a given Fourier-Mukai equivalence of bounded derived categories of coherent sheaves on smooth quasi-projective varieties, we obtain Fourier-Mukai equivalences of derived factorization categories of gauged LG models. As an application, we show some equivalences of derived factorization categories of K-equivalent gauged LG model.

- **Akishi Ikeda**

  Title: *Stability conditions on Calabi-Yau completions for formal parameters*

  Abstract: The aim of this talk is to define the space of stability conditions on an s-Calabi-Yau category for a complex number s. For this purpose, we introduce a Calabi-Yau completion for a formal parameter and a variation of a Bridgeland stability condition on it. We also discuss the relationship between central charges of these stability conditions on Calabi-Yau completions of ADE-quivers and twisted periods of ADE-singularities.

- **Kohei Iwaki**

  Title: *Topological recursion, quantum curves and Painlevé equations*

  Abstract: In this talk, I'll explain about a relationship between the Eynard-Orantin's topological recursion and Painlevé equations. More precisely, generalizing some results of Eynard-Orantin and their collaborators, we'll show that the free energy defined by the topological recursion gives a tau-function the Painlevé equations (for the first and the second equations; work in progress for other Painlevé equations). Moreover, we'll see that the topological recursion also recover the isomonodromy linear system (as a quantum curve) for these Painlevé equations form their spectral curve. This talk is based on the joint work with Olivier Marchal (Lyon) and Axel Saenz (UC Davis).

- **Atsushi Kanazawa**

  Title: *A partial compactification of the Hori-Vafa toric mirror symmetry*

  Abstract: In this talk, I will introduce a partial compactification of mirror symmetry for a class of toric Calabi-Yau manifolds, discussing a new connection between SYZ mirror symmetry and modular forms. This also gives an insight into mirror symmetry for varieties of general type (for example, Seidel's work on genus two Riemann surfaces). If time permits, I will discuss a higher dimensional analogue of the Yau-Zaslow formula for an elliptic K3 surface. This talk is based on a joint work with Siu-Cheong Lau.

- **Bumsig Kim**

  Title: *Mirror Theorem for Elliptic Quasimap Invariants*

  Abstract: This is a joint work with Hyenho Lho. We present a mirror theorem for the elliptic quasimap invariants of smooth Calabi-Yau complete intersections in projective spaces. The theorem combined with the wall-crossing formula implies mirror theorems of Zinger and Popa for the elliptic Gromov-Witten invariants of those varieties. The theorem and the wall-crossing formula provide a unified framework for the mirror theory of rational and elliptic Gromov-Witten invariants.

- **Makoto Miura**

  Title: *Complete intersection Calabi–Yau threefolds in Grassmannians with respect to homogeneous vector bundles*

  Abstract: I will talk about recent joint works with Daisuke Inoue and Atsushi Ito, on complete intersection Calabi–Yau threefolds in Grassmannians with respect to homogeneous vector bundles. We focus on those Calabi–Yau threefolds with Picard number one and describe their geometry. I will also explain the computation of the I-functions of those Calabi– Yau threefolds and discuss the mirror construction via conifold transition.

- **Takuro Mochizuki**

  Title: *A twistor approach to Kontsevich complexes*

  Abstract: Kontsevich complexes are families of complexes associated to algebraic functions on smooth complex algebraic varieties. The concept was introduced by M. Kontsevich in his study on the B-side of mirror symmetry. In this talk, we revisit some interesting results due to H. Esnault, M. Kontsevich, C. Sabbah, M. Saito and J.-D. Yu on Kontsevich complexes from a twistor viewpoint. After a brief review on the general theory of mixed twistor D-modules, we explain how to apply it to obtain the results on Kontsevich complexes. We hope that this viewpoint would be useful to understand the generalized Hodge theoretic property of Kontsevich complexes.

- **Takeo Nishinou**

  Title: *Degeneration and curves on K3 surfaces*

  Abstract: A folklore conjecture concerning rational curves on K3 surfaces states that all K3 surfaces contain infinite number of irreducible rational curves. It is known that all K3 surfaces, except those contained in the countable union of hypersurfaces in the moduli space of K3 surfaces satisfy this property. In this talk, we present a new approach to this problem

and prove that there is a Zariski open dense subset in the moduli space of quartic K3 surfaces whose members satisfy the conjecture. We also mention the case of more general K3 surfaces.

- **Shinnosuke Okawa**

  Title   *Compact moduli of marked noncommutative cubic surfaces via quivers*

  Abstract: I will explain in some detail about the compactified moduli spaces of marked noncommutative cubic surfaces constructed by using quivers. In particular I will show how the moduli spaces of quiver representations are used to recover the data of a noncommutative projective plane plus six points on it from the given relations of the quiver. This is a joint work with Tarig Abdelgadir and Kazushi Ueda.

- **Genki Oouchi**

  Title   *Lagrangian embeddings of cubic fourfolds containing a plane*

  Abstract: For a cubic 4-fold X not containing a plane, Lehn et al constructed an irreducible holomorphic symplectic 8-fold which contains X as a Lagrangian submanifold via twisted cubic curves on X. In this talk, I will talk about Lagrangian embeddings of cubic 4-folds containing a plane. The desired irreducible holomorphic symplectic 8-fold can be constructed as a moduli space of Bridgeland stable objects on the derived categories of twisted K3 surfaces.

- **Jiro Sekiguchi**

  Title: *A generalization of WDVV equation and its applications*

  Abstract: The WDVV equation arose from 2D topoligical field theory. In this talk, I introduce a generalization of WDVV equation and apply it to flat coordinate system for irreducible well-generated complex reflection groups and Painlevé VI. This is a joint work with M. Kato and T. Mano.

- **Elizabeth Werner**

  Title: *Orbifold Jacobian Algebras for Invertible Polynomials*

  Abstract: Let f be a quasihomogeneous polynomial with an isolated singularity at the origin. The Jacobian algebra of f is the local algebra of its partial derivatives. It is finite dimensional and has the structure of a Frobenius algebra. We consider a group action on f. Let G be a finite group of symmetries of f. The pair (f,G) is often called a Landau-Ginzburg orbifold. We want to construct an orbifold version of the Jacobian algebra for the pair (f,G). This is a joint work with Alexey Basalaev and Atsushi Takahashi.

- **Ken-Ichi Yoshikawa**

  Title: *BCOV invariant for Borcea-Voisin threefold*

  Abstract: BCOV invariant is a holomorphic torsion invariant of Calabi-Yau threefold, giving the genus-one string amplitude in B-model. Mirror symmetry at genus-one is formulated as an explicit infinite product expression of the BCVO invariant near the large complex structure limit point in terms of genus-one instant numbers. In this talk, I will explain an explicit formula for the BCOV invariant for Borcea-Voisin threefolds. If time permits, I will also explain the construction of BCOV invariant for Calabi-Yau orbifolds and its twisted version, as well as some of their properties.