

# Primitive Forms, Mirror Symmetry and Related Topics 2014

Date: 24 Dec 2014 – 26 Dec 2014

Place: Room 127 (Building no.3), Department of Mathematics, Kyoto University

	10:30 – 11:30	11:45 – 12:45		14:30 – 15:30	15:45 – 16:45	17:00 – 18:00
<b>24</b>	Ohta	Sanda	lunch	Kajiura	Sugiyama	Ono
	9:30 – 10:30	11:00 – 12:00		14:00 – 15:00	15:15 – 16:15	16:30 – 17:30
<b>25</b>	K. Saito	Hori	lunch	Yoshinaga	Si Li	Milanov
<b>26</b>	Ueda	Toda	lunch	Bondal	Uehara	M. Saito

## 24 December

10:30 – 11:30	Hiroshi Ohta	<i>Trace map in cyclic <math>A_\infty</math> category</i>
11:45 – 12:45	Fumihiko Sanda	<i>Fukaya categories and blowups</i>
14:30 – 15:30	Hiroshige Kajiura	<i>More on <math>A_\infty</math> enhancements of triangulated categories</i>
15:45 – 16:45	Satoshi Sugiyama	<i>On the Fukaya-Seidel categories of surface Lefschetz fibrations</i>
17:00 – 18:00	Kaoru Ono	<i>Idempotents in quantum cohomology and non-displaceable Lagrangian submanifolds</i>

## 25 December

9:30 – 10:30	Kyoji Saito	<i>Coherency of direct images of de-Rham complex by open holomorphic map</i>
11:00 – 12:00	Kentaro Hori	<i>Grade restriction rule in Rødland model</i>
14:00 – 15:00	Masahiko Yoshinaga	<i>Primitive forms and the Kostant-Kirillov form</i>
15:15 – 16:15	Si Li	<i>Mirror theorem between Landau-Ginzburg models</i>
16:30 – 17:30	Todor Milanov	<i>Mirror symmetry and the global ancestor potential</i>

## 26 December

9:30 – 10:30	Kazushi Ueda	<i>On a certain generalization of triangle singularities</i>
11:00 – 12:00	Yukinobu Toda	<i>Non-commutative width and Gopakumar-Vafa invariants</i>
14:00 – 15:00	Alexey Bondal	<i>The structure of the null-category for birational morphisms of reldim 1</i>
15:15 – 16:15	Hokuto Uehara	<i>Autoequivalences of derived categories of elliptic surfaces with non-zero Kodaira dimensions.</i>
16:30 – 17:30	Morihiko Saito	<i>On the structure of Brieskorn lattices.</i>

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Organizer: Hiroshi Iritani, Yukiko Konishi, Astushi Takahashi

## Abstracts

### Hiroshi Ohta

Title: *Trace map in cyclic  $A_\infty$  category*

Abstract: Based on my joint work with Fukaya, Oh, Ono, I will introduce the trace map in cyclic  $A_\infty$  category as one-loop partition function, and discuss some aspect of the universal deformation of the potential function in Lagrangian Floer theory for toric case.

### Fumihiko Sanda

Title: *Fukaya categories and blowups*

Abstract: In this talk, we study about the behavior of Fukaya categories under blowups by using SYZ mirror symmetry. We also explain how to extract information about quantum cohomology from Fukaya categories.

### Hiroshige Kajiura

Title: *More on  $A_\infty$  enhancements of triangulated categories.*

Abstract: In this talk we concentrate on triangulated categories generated by exceptional collections and discuss various classes of such triangulated categories whose A-infinity enhancements are unique or nonunique up to A-infinity equivalences. We also mention geometric examples corresponding to some of these triangulated categories.

### Satoshi Sugiyama

Title: *On the Fukaya-Seidel categories of surface Lefschetz fibrations*

Abstract: In this talk, we study about the Fukaya-Seidel category of exact Lefschetz fibrations that the dimension of the fibre is two and possible application to low dimension topology. In such a case, the derived Fukaya-Seidel category is independent of the choice of the exact symplectic structure and can be computed in combinatorial way. I will introduce some computational examples and some problems.

### Kaoru Ono

Title: *Idempotents in quantum cohomology and non-displaceable Lagrangian submanifolds*

Abstract: In a joint work with Fukaya, Oh and Ohta, we gave a criterion for a Lagrangian submanifold to be heavy/superheavy with respect to a partial symplectic quasi-state associated with an idempotent of quantum cohomology. It fits quite well with a generation criterion of Fukaya category, which we obtained with Abouzaid. In this talk, I would like to explain our criterion. In particular, I would like to consider the following example. The quantum cohomology of the symplectic blow-up of a symplectically aspherical manifold  $(X, \omega)$  contains a field as a direct summand. The unit of the field is an idempotent of quantum cohomology. If the size of the symplectic blow-up is less than a constant  $C(X, \omega)$ , we can find a superheavy Lagrangian torus with respect to the symplectic quasi state associated with this idempotent.

## Kyoji Saito

Title: *Coherency of direct images of de-Rham complex by open holomorphic map.*

Abstract: There are two formulations of Coherence Theorem for proper morphisms. One: an algebraic proof for projective morphisms by Grothendieck, and the other: a complex analytic proof for proper holomorphic morphisms by Grauert. The latter uses functional analysis of the Fréchet spaces of holomorphic functions on Stein-manifolds, but was somehow forgotten. However, the advantage is that its technique is applicable to non-proper morphisms. I'll explain how the technique is used to show a cohenency of certain relative de-Rham cohomology groups for some Stein morphisms based on an unpublished old result of the speaker.

## Kentaro Hori

Title: *Grade Restriction Rule in Rødland Model*

Abstract: The talk is about D-branes in “Rødland model”, a gauged linear sigma model with two geometric phases — Pfaffian phase and Grassmannian phase, as well as in another model (“Hosono-Takagi model”) with the similar feature. The “grade restriction rule” for each window between the two phases is presented. This yields the rule of D-brane transport through the windows and in particular the monodromy around the singular points. The hemisphere partition function is used to find the rule. Based on a joint work with Richard Eager, Johanna Knapp and Mauricio Romo.

## Masahiko Yoshinaga

Title: *Primitive forms and the Kostant-Kirillov form.*

Abstract: The Weyl group quotient of the Cartan subalgebra for a simple Lie algebra of type ADE has the flat structures. There are two ways to describe them. One is by the general framework of primitive forms (based on the fact that the Kostant-Kirillov form can be considered as a primitive form). The other is by the invariant-theoretic method. In this talk, we will develop an invariant-theoretic way of computing Gauss-Manin differentiation of the Kostant-Kirillov form, and then discussing the relationship between the above two constructions.

## Si Li

Title: *Mirror Theorem between Landau-Ginzburg models.*

Abstract: In this talk, I will prove the Landau-Ginzburg mirror symmetry conjecture for general quasi-homogenous singularities, i.e., the FJRW theory (LG A-model) of such polynomials is equivalent to the Saito-Givental theory (LG B-model) of the mirror polynomial. This is joint work with Weiqiang He, Rachel Webb and Yefeng Shen.

**Todor Milanov**

Title: *Mirror symmetry and the global ancestor potential.*

Abstract: I'm planning to talk about a joint work in progress with H. Iritani, Y. Ruan, and Y. Shen. Using Givental's higher genus reconstruction and Saito's theory of primitive forms we define a global total ancestor potential as a function on the total space of a certain line bundle with values in a Fock space. I will discuss also the applications of this construction to mirror symmetry.

**Kazushi Ueda**

Title: *On a certain generalization of triangle singularities*

Abstract: Triangle singularities are Fuchsian singularities associated with von Dyck groups, which are index two subgroups of Schwarz triangle groups. Hypersurface triangle singularities are classified by Dolgachev, and give 14 exceptional unimodal singularities classified by Arnold. In the talk, we will discuss a joint work with Kenji Hashimoto and Hwayoung Lee on a higher-dimensional generalization of triangle singularities. In particular, we show that there are only finitely many hypersurface singularities of this type in each dimension, and give a complete list in dimension 3.

**Yukinobu Toda**

Title: *Non-commutative width and Gopakumar-Vafa invariants.*

Abstract: I show that the non-commutative widths for flopping curves on smooth 3-folds introduced by Donovan-Wemyss are described by Katz's genus zero Gopakumar-Vafa invariants.

**Alexey Bondal**

Title: *The structure of the null-category for birational morphisms of reldim 1.*

Abstract: We will give an algebraic description for the null-category of a birational morphism between smooth surfaces.

**Hokuto Uehara**

Title: *Autoequivalences of derived categories of elliptic surfaces with non-zero Kodaira dimensions.*

Abstract: We study the group of autoequivalences of the derived categories of coherent sheaves on smooth projective elliptic surfaces with non-zero Kodaira dimensions. We find a description of it when each reducible fiber is a cycle of  $(-2)$ -curves.

**Morihiko Saito**

Title: *On the structure of Brieskorn lattices.*

Abstract: We plan to explain the structure of Brieskorn lattices related to primitive forms including the formal setting recently studied by C. Li, S. Li, and K. Saito.