

Workshop on Mirror Symmetry and Related Topics, Kyoto 2024

Duration: 9-13 December 2024

Venue: Room 127 (Graduate School of Science Bldg no.3), Department of Mathematics, Kyoto University

The workshop website:

<https://www.math.kyoto-u.ac.jp/~iritani/mirrorsymmetry2024/Workshop2024.html>.

Schedule:

	9:00-10:00	10:00-11:00	11:30-12:30	lunch	14:30-15:30	16:00-17:00
9 Mon	registration	Hong	Lau 1		Varolgunes 1	You 1
10 Tue	★	★	★		Varolgunes 2	You 2
11 Wed	★	Iwanari	Lau 2		★	★
12 Thu	★	Scheidegger	Okawa		Mochizuki	Zhou
13 Fri	★	Kuwagaki	Nishida/Hau		Romo	★

★ : free discussion

Speakers and Titles:

ChunYin Hau	<i>Asymptotic properties of J-function and Gamma conjecture I</i>
Hansol Hong	<i>Closed string mirror symmetry for punctured Riemann surfaces</i>
Isamu Iwanari	<i>Categorified LG models and their transformations</i>
Tatsuki Kuwagaki	<i>Fukaya-Sheaf correspondence over the Novikov ring for prequantizable Lagrangians</i>
Siu-Cheong Lau	1. <i>Gauge theory for nodal surfaces and Nakajima quiver varieties</i> 2. <i>Teleman's conjecture and equivariant Lagrangian Floer theory</i>
Takuro Mochizuki	<i>Irregular Hodge theory and rigidity</i>
Azuna Nishida	<i>Homological mirror symmetry for weighted projective spaces and Morse homotopy</i>
Shinnosuke Okawa	<i>Blowing down noncommutative cubic surfaces</i>
Mauricio Romo	<i>Mirror Symmetry for singular Calabi-Yau double covers</i>
Emanuel Scheidegger	<i>On genus one fibered Calabi-Yau threefolds</i>
Umut Varolgunes	<i>Floer theoretic invariants with support and mirror symmetry</i>
Fenglong You	<i>Intrinsic mirror symmetry and theta functions via root stacks</i>
Yang Zhou	<i>Mixed-Spin-P fields for GIT quotients</i>

Organizers: Hiroshi Iritani, Yukiko Konishi, Atsushi Takahashi

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ChunYin Hau

Asymptotic properties of J -function and Gamma conjecture I

Considering the asymptotic behavior of Givental's J -function of a Fano manifold along the anti-canonical line, one can define the principal asymptotic class of the manifold. This class is closely related to the Gamma class, which can be considered as a square root of the Todd class and plays a crucial role in defining the integral structure of quantum cohomology. In this talk, I will present a proposed asymptotic condition on the coefficients of the J -function as a power series. This condition can aid in the computation of the principal asymptotic class of a Fano manifold.

Hansol Hong

Closed string mirror symmetry for punctured Riemann surfaces

I'll review several constructions of a Landau-Ginzburg mirror for a punctured Riemann surface, and discuss how to achieve its closed-string mirror symmetry, mainly focusing on the noncommutative mirror introduced by Bocklandt. Our approach involves a geometrically constructed ring homomorphism from the symplectic cohomology of the surface to some Hochschild-type invariant of the mirror matrix factorization category.

Isamu Iwanari

Categorified LG models and their transformations

I will introduce categorified LG models. This notion is a kind of categorification of LG models and is defined as stable infinity categories over a certain stack. A notable feature is that they have self-duality, which can be thought of as a higher duality phenomenon. I will discuss this topic from the perspective of matrix factorizations, their Hodge realizations and exceptional deformations.

Tatsuki Kuwagaki

Fukaya-Sheaf correspondence over the Novikov ring for prequantizable Lagrangians

For each Liouville manifold, we define the category of sheaf quantizations, which is a category of Lagrangian branes and is defined sheaf-theoretically. The category is conjectured to be equivalent to the Fukaya category over the Novikov ring. In this talk, I would like to explain the backgrounds and a proof of the conjecture for prequantizable Lagrangians in Weinstein manifolds. This talk will be mainly based on a joint work with Adrian Petr and Vivek Shende.

Siu-Cheong Lau

1st talk. *Gauge theory for nodal surfaces and Nakajima quiver varieties*

In this talk, I will explain a relation between framed immersed spheres and Nakajima quiver varieties via localized mirror functor. Holomorphic symplectic structures and complex moment maps naturally come up from Floer theory of nodal surfaces. Moreover, monadic complexes that are essential ingredients of ADHM construction and its generalizations are resulted as images of the functor. This is a joint work with Jiawei Hu and Ju Tan.

2nd talk. *Teleman's conjecture and equivariant Lagrangian Floer theory*

Teleman conjectured that the mirror of a Hamiltonian action on a symplectic manifold is a holomorphic fibration. In this talk, I will explain a fibration on localized moduli of Lagrangians via equivariant Lagrangian Floer theory, and a comparison with the quotient via equivariant Lagrangian correspondence. Obstruction of Lagrangian correspondence occurs even in simple examples. We also study its relation with Seidel elements and degenerations. This is a joint work with Nai-Chung Conan Leung and Yan-Lung Leon Li.

Takuro Mochizuki

Irregular Hodge theory and rigidity

Motivated by the study of an appropriate generalization of Hodge filtrations, we obtained an equivalence between rescalable integrable mixed twistor D -modules and exponential mixed Hodge modules. We shall explain an ongoing study to an irregular version of Simpson's theorem, saying a rigid local system on a complex projective manifold underlies a polarized variation of Hodge structure.

Azuna Nishida

Homological mirror symmetry for weighted projective spaces and Morse homotopy

Kontsevich and Soibelman discussed homological mirror symmetry (HMS) by using the SYZ torus fibrations, where they introduced the weighted version of the Fukaya-Oh category or the category of Morse homotopy on the base space of the dual torus fibration in the intermediate step. Recently, Futaki and Kajiura applied Kontsevich-Soibelman's approach to the case of smooth compact toric manifolds. They considered the category of weighted Morse homotopy on the moment polytope as a generalization to the case where the base manifold has boundaries. In this talk, we discuss HMS for weighted projective spaces in this line as examples of HMS for toric orbifolds.

Shinnosuke Okawa

Blowing down noncommutative cubic surfaces

In 2001 Van den Bergh defined the notion of blowup for noncommutative surfaces and showed that the blowup of a noncommutative \mathbb{P}^2 in 6 points is isomorphic to a cubic surface of a noncommutative \mathbb{P}^3 of certain type. I will explain that the converse is also true under reasonable genericity assumptions; namely, cubic surfaces of such a noncommutative \mathbb{P}^3 s are obtained as blowups. The crux of the proof is to understand the global monodromy of the co-called line modules on the pencil of noncommutative cubic surfaces. This is a joint work in progress with Ingalls, Sierra, and Van den Bergh.

Mauricio Romo

Mirror Symmetry for singular Calabi-Yau double covers

Emanuel Scheidegger

On genus one fibered Calabi-Yau threefolds

Genus one fibered Calabi-Yau threefolds appear in various places in string theory and algebraic geometry. We will present a class of such fibrations with 5-sections that arise as homologically projective dual pairs. Their realization in physics is in terms of a gauged linear sigma model with nonabelian gauge group. Their topological string partition function shows interesting modular behaviour. We will also comment on the case of 6-sections.

Umut Varolgunes

Floer theoretic invariants with support and mirror symmetry

In the first lecture I will explain the construction of open and closed string Floer theoretic invariants with support on compact subsets of a closed symplectic manifold. A proof of the local to global property will be sketched. In the second talk I will use these invariants to prove homological mirror symmetry for elliptic curves and certain $K3$ surfaces.

Fenglong You

Intrinsic mirror symmetry and theta functions via root stacks.

A fundamental question in mirror symmetry is to construct mirrors. I will explain Gross–Siebert’s intrinsic mirror symmetry construction which gives a mirror construction using relative quantum cohomology. For a Calabi–Yau manifold or a log Calabi–Yau manifold, one considers a maximally unipotent monodromy degeneration of the (log) Calabi–Yau manifold and take proj of the degree zero part of a relative quantum cohomology ring associated with the degeneration. Theta functions form a canonical basis of the degree zero part of the relative quantum cohomology ring. Theta functions can be defined in terms of punctured logarithmic Gromov–Witten invariants of the broken line type.

For the first part, I will review a variant of intrinsic mirror symmetry using orbifold Gromov–Witten invariants of root stacks. For the second part, I will explain generalizations of theta functions and possible applications to questions in mirror symmetry.

Yang Zhou

Mixed-Spin-P fields for GIT quotients

The theory of Mixed-Spin-P fields was introduced by Chang-Li-Li-Liu for the quintic threefold, aiming at studying its higher genus Gromov–Witten invariants. Chang-Guo-Li has successfully applied it to prove famous conjectures on the higher-genus Gromov–Witten invariants proposed by physicists. In this talk I will explain a general construction of Mixed-Spin-P fields for a large class of GIT quotients, and give some concrete examples. The key is a stability condition which guarantees the separatedness and properness of the so-called cosection degeneracy locus. It also generalizes the construction of the mathematical Gauged Linear Sigma Model by Fan-Jarvis-Ruan.

This is a joint work with Huai-Liang Chang, Shuai Guo, Jun Li and Wei-Ping Li.