On explicit description of holomorphic symplectic varieties

Venue Onuma International Seminar House.

Period 2016 Aug 29 (Mon.) — Sep. 01 (Thu.)

Timetable

	Aug 29 (Mon).	Aug 30 (Tu.)	Aug. 31 (Wed.)	Sep. 01 (Thu.)
9:00—10:30	D. Matsushita	R. Yamagishi	K. Yoshioka	M. Lehn
11:00—12:30	G. Menet	G. Mongardi	N. Addington	Y. Namikawa
14:00—15:30	L. Fu	C. Camere	D. Piyaratne	
16:00—17:30	Y. Nagai	C. Lehn	H. Ohashi	

Titles and Abstracts.

Nicolas Addington

TItle New rational cubic fourfolds.

Abstract We study cubic fourfolds of discriminant 18: a generic one contains an elliptic ruled surface; blowing this up, we get a fibration in sextic del Pezzo surfaces; if this admits a rational section, then the cubic is rational; this happens in a countable union of 18-dimensional Noether-Lefschetz loci. There is an associated K3 surface of degree 2 with a 3-torsion Brauer class, which vanishes if and only if the del Pezzo fibration admits a rational section. This is joint work with Hassett, Tschinkel, and Varilly-Alvarado.

Chiera Camere

Title Calabi–Yau quotients of irreducible holomorphic symplectic manifolds

Abstract In this talk I will explain how to construct Calabi–Yau manifolds starting from irreducible holomorphic symplectic manifolds endowed with non-symplectic automorphisms of prime order. Then I will restrict to dimension four and describe the geometry of the Calabi–Yau fourfolds obtained as resolutions of quotients of fourfolds of $K3^{[2]}$-type by a non-symplectic involution, and finally use this to construct projective models of some fourfolds of $K3^{[2]}$-type. This is joint work with Alice Garbagnati and Giovanni Mongardi.

Lie Fu

Title Symplectic resolution and explicit description of Chow rings of certain symplectic varieties

Abstract We give an explicit description for

(1) The Chow ring of a Hilbert scheme of a K3 surface S in terms of Chow rings of self-products of S; (2) The Chow ring of a Hilbert scheme of an abelian surface surface A in terms of Chow rings of self-products of A; (3) The Chow ring of a generalized Kummer variety associated to an abelian surface A in terms of Chow rings of self-products of A. All these results follow from a motivic version of Ruan's hyperkähler resolution conjecuture, which says that the Chow ring of a symplectic resolution of a singular symplectic variety is isomorphic to the orbifold Chow ring of the stack overlying the singular symplectic variety. These are joint work with Zhiyu Tian and Charles Vial.

Christian Lehn

Title Polar representations and symplectic reductions

Abstract For a polar representation, the (reduced) symplectic reduction of the symplectic double is conjectured to be a quotient by a finite group. More precisely, the conjecture predicts it to be isomorphic (as Poisson schemes) to the quotient of the symplectic double of the Cartan subspace by Weyl group. In a joint work with M. Bulois, M. Lehn and R. Terpereau it is shown that there is a natural morphism of Poisson schemes and that the conjecture holds for visible stable locally free polar representations. The conjecture is shown to be sharp by various examples. In particular, the symplectic reduction is a singular symplectic variety in these cases.

Manfred Lehn

Title The involution on the 8-dimensional symplectic manifold associated to a cubic fourfold

Daisuke Matsushita

Title On freeness of divisors on irreducible symplectic manifolds

Absract We will discuss freeness of various divisors on irreducible symplectic manifolds.

Gregorie Menet

Title On irreducible holomorphic symplectic V-manifolds

Abstract In algebraic geometry irreducible holomorphic symplectic (IHS) manifolds became important objects of study in recent years, after the fundamental results by Beauville and Huybrechts. However, until now very few deformation classes of such manifolds are known. In order to enlarge the short list of known IHS manifolds, one possible way is to allow some singularities. Thus, the irreducible holomorphic symplectic (IHS) V-manifolds appear to be the simplest candidates for such a generalization. In this talk we will first see how the specificities of the (IHS) V-manifolds provide an interesting context for generalizing basic results known in the smooth case. Then, we will illustrate our presentation by an example of (IHS) V-manifold introduced by Markushevich and Tikhomirov which carries a Lagrangian fibration.

Giovanni Mongardi

Title The O'Grady's six dimensional manifold as a quotient

Abstract This work is joint with A. Rapagnetta and G. Saccà, we construct one of the exotic examples of holomorphic symplectic manifolds as the quotient by a non regular involution on the Hilbert scheme of three points on a Kummer surface. We use this construction to compute Hodge numbers of the O'Grady's sixfold and, time permitting, i will sketch additional properties of this manifold which can be obtained from this construction.

Yasunari Nagai

Title Relations among determinantial invariants

Abstract A ring of invariants for vectors, linear forms, and matrices frequently appears in the theory of moduli spaces. A knowledge of generators and relations among them sometimes (maybe with a help of computer) enables us to describe a moduli space explicitly. We discuss an explicit relations and bounds of generators in such an invariant ring.

Yoshinori Namikawa

Title A characterization of nilpotent orbit closures among symplectic singularities

Abstract A symplectic singularity (X, ω) is conical if it admits a C^*-action with positive weights and ω is homogeneous. A conical symplectic variety plays an important role in algebraic geometry and geometric representation theory.

In this talk, we prove that if X is singular and the coordinate ring R of X is generated by degree one part R_1, then (X, ω) is isomorphic to a nilpotent orbit closure of a complex semisimple Lie algebra with the Kostant-Kirillov form.

We first prove that R_1 is a Lie algebra $\mathfrak{g}$ by the Poisson structure on X, and next prove that X is the closure of a coadjoint orbit of $\mathfrak{g}^*$. Finally we prove that $\mathfrak{g}$ is semisimple. This final part is the essential ingredient of our proof.

Hisanori Ohashi

Title On some families of Enriques surfaces parametrized by rational modular curves

Abstract We discuss two families of Enriques surfaces, namely Kondo's surfaces of type II and the family given in the work of Mukai and the speaker. They have pleasant presentations of automorphism groups and curve configurations. We will exhibit a new explicit equation for the former and give a relationship to the elliptic modular surfaces.

Dulip Piyaratne

Title Generalized Bogomolov-Gieseker type inequality for Fano 3-folds

Abstract Construction of Bridgeland stability conditions on a given smooth projective 3-fold is an important problem. A conjectural construction for any 3-fold was introduced by Bayer, Macri and Toda, and the problem is reduced to proving so-called Bogomolov-Gieseker type inequality holds for certain stable objects in the derived category. It has been shown to hold for Fano 3-folds of Picard rank one due to the works of Macri, Schmidt and Li. However, Schmidt gave a counter-example for a Fano 3-fold of higher Picard rank. In this talk, I will explain how to modify the original conjectural inequality for general Fano 3-folds in order to get a family of Bridgeland stability conditions and why it holds.

Ryo Yamagishi

Title Crepant resolutions of Slodowy slices in nilpotent orbit closures in $\mathfrak{sl}_n(\mathbb{C})$

Abstract Nilpotent orbit closures and their intersections with Slodowy slices are typical examples of symplectic varieties. It is known that every crepant resolution of a nilpotent orbit closure is obtained as a Springer resolution. In this talk we show that all crepant resolutions of Slodowy slices in nilpotent orbit closures in $\mathfrak{sl}_n(\mathbb{C})$are obtained as the restriction of Springer resolutions and we explain how to count the number of the resolutions. The proof of the results is based on the fact that the Slodowy slices can be described as quiver varieties of type A.

Kota Yoshioka

Title Moduli spaces of stable sheaves on Enriques surfaces

Abstract I will talk on moduli space of stable sheaves on Enriques surfaces. In particular, I will explain the non-emptyness and a new proof of the irreducibility of the moduli spaces.