

Arnaud Beauville

The Chow ring of hyperkähler manifolds

This is a survey of the progress obtained in the last 10 years on the Chow ring of projective hyperkähler manifolds. Starting from the case of K3 surfaces, I will explain why one may hope that this Chow ring admits a natural grading. While this conjecture seems inaccessible at the moment, it implies some concrete consequences on intersections of divisors, which have been verified in an increasing number of cases. I will also discuss the "motivic" approach of Shen and Vial to the conjectures.

Michele Bolognesi

Moduli of Abelian Surfaces and varieties of sums of powers

In this talk we will explore the birational geometry of some moduli spaces of abelian varieties with extra structure: in particular, with a symmetric theta structure and an odd theta characteristic. For a (d_1, d_2) -polarized abelian surface, we will show how the parities of the d_i influence the relation between canonical level structures and symmetric theta structures. For certain values of d_1 and d_2 , the choice of a theta characteristic is needed in order to define Theta-null maps. In particular we will focus on the moduli space of surfaces with a $(1,7)$ -polarization, a symmetric theta structure and an odd theta characteristic. We will show that it is birational to a new type of VSP, this in turn will allow us to show that it is unirational.

Paweł Borówka

Non-simple abelian varieties

A general complex principally polarised abelian variety is simple, i.e. do not contain an abelian subvariety apart from 0 and itself. In the talk I will show that the locus of non-simple abelian varieties in the moduli of principally polarised abelian varieties of dimension g is the countable union of irreducible components Is_D^g that are loci of all varieties that contain a subvariety of dimension $k \leq \frac{g}{2}$ with restricted polarisation of type $D = (d_1, \dots, d_k)$. Moreover, I will show equations on the coefficients of period matrices that give Is^-D .

Yohan Brunebarbe

Hyperbolicity of varieties uniformized by a bounded symmetric domain

In this talk we will discuss several hyperbolicity properties of smooth complex algebraic varieties uniformized by a bounded symmetric domain. Our results apply to many moduli spaces of varieties, including moduli spaces of polarized abelian varieties and polarized K3 surfaces.

Chiara Camere

Moduli spaces of smooth cubic threefolds and of irreducible holomorphic symplectic manifolds

In this talk, I will describe an isomorphism between the moduli space of smooth cubic threefolds, as described by Allcock, Carlson and Toledo, and the moduli space of fourfolds of $K3^{[2]}$ -type with a special non-symplectic automorphism of order three; then, I will show some consequences of this isomorphism concerning degenerations of non-symplectic automorphisms. This is a joint work in progress with S. Boissière and A. Sarti.

Martin Gulbrandsen

Degenerations of Hilbert schemes of points

In an attempt at exploring degenerations of hyper-Kähler manifolds, and with the Kulikov–Pinkham–Persson degenerations of K3 surfaces as guide, I will explain a GIT construction of degenerations of Hilbert schemes, building on ideas due to Li–Wu on admissible subschemes in expanded degenerations. As application we produce examples of degenerations of $Hilb^n(K3)$ which are good minimal dlt-models, with dual complex of the degenerate fibre being simplicial subdivisions of an n -simplex. This is joint work with Lars Halle, Klaus Hulek and Ziyu Zhang.

Alexander Kasprzyk

Mirror Symmetry and Fano manifolds

Recent work by Coates, Corti, Galkin, Golyshev, Kasprzyk, and others has opened up the possibility of classifying Fano manifolds using techniques inspired from Mirror Symmetry. In many respects this is a very combinatorial approach, and so has the advantage of allowing for computer-aided systematic searches. Many aspects of this work are

still conjectural, and no doubt the details will change over the coming years, however the general experimental picture is exciting, and suggests a new, rich connection between geometry and combinatorics. In this talk I will sketch the progress so far, and highlight the novel combinatorial constructions and key conjectures.

Martí Lahoz

Cubic fourfolds and non-commutative K3 surfaces

The derived category of coherent sheaves on a smooth cubic fourfold has a subcategory that can be thought as the derived category of a non-commutative K3 surface. This category has recently been studied by Kuznetsov and Addington-Thomas, among others. In this talk, I will present joint work with Bayer, Macrì, and Stellari about the construction of Bridgeland stability conditions on this category and some applications.

Adrian Langer

On lifting of Calabi-Yau 3-folds to characteristic 0

I will survey various results related to lifting Calabi-Yau 3-folds defined over fields of positive characteristic. In particular, I will show some Calabi-Yau 3-folds that cannot be lifted and formulate some general conjectures.

Hyenho Lho

Stable quotients and holomorphic anomaly equation

I will introduce the stable quotient invariants and explain the relationship with Gromov-Witten invariants. After that I will prove holomorphic anomaly equation for stable quotient invariant of local $\mathbb{C}P^2$ in the form predicted by B-model physics. If I have more time, I will also discuss about holomorphic anomaly equation for $[C3/Z3]$ and formal quintic. This talk is based on joint work with Rahul Pandharipande.

Diane Maclagan

Tropical schemes

Tropical geometry allows varieties, and their compactifications and degenerations, to be studied using combinatorial and polyhedral techniques. While this idea has proved surprisingly effective over the last decade, it has so far been restricted to the study of varieties and algebraic cycles. I will discuss joint work with Felipe Rincon that gives a

definition for of a subscheme of a tropical toric variety. This builds on work of Jeff and Noah Giansiracusa on tropicalizing subschemes.

Laurent Manivel

Orbital degeneracy loci

Zero loci of sections of vector bundles, more generally, degeneracy loci of morphisms between vector bundles, are ubiquitous in algebraic geometry. Orbital degeneracy loci provide a vast generalization of those, modeled on orbits closures of algebraic groups in their linear representations. This is a very flexible tool, that allows in particular to construct new projective varieties with trivial canonical bundles. (Joint with V. Benedetti, S. Filippini, F. Tantarri.)

Ciaran Meachan

Universal functors and derived autoequivalences

The group of autoequivalences of the derived category of coherent sheaves on a variety is an interesting and subtle geometric object. Any autoequivalences beyond the 'standard' ones – automorphisms of the variety itself, twists by line bundles, and homological shift – should be thought of as 'hidden symmetries' of the variety. I will discuss new examples of such symmetries when the underlying variety is the Hilbert scheme of points on an Abelian surface. This is based on joint work with Andreas Krug.

John Christian Ottem

The birational Torelli problem for Calabi-Yau 3-folds

The intersection of two general $PGL(10)$ -translates of $Gr(2, 5)$ is a Calabi-Yau 3-fold X , and the intersection of the projective duals of the two translates is another Calabi-Yau 3-fold Y , deformation equivalent to X . We show that X and Y provide counterexamples to a certain "birational" Torelli statement for Calabi-Yau 3-folds, namely, they are deformation equivalent, derived equivalent, and have isomorphic Hodge structures, but they are not birational. This is joint work with Jorgen Vold Rennemo.

Victor Przyjalkowski

Landau–Ginzburg Hodge numbers

We discuss Katzarkov–Kontsevich–Pantev definitions of Hodge numbers for Landau–Ginzburg models. We prove Hodge numbers mirror

symmetry for them in the case of del Pezzo surfaces. We use Calabi–Yau compactifications of toric Landau–Ginzburg models for this. If time permits we discuss three-dimensional case as well.

Ulrike Rieß

Base loci of big and nef line bundles on irreducible symplectic varieties

In this talk, we present results on base loci of big and nef line bundles on irreducible symplectic varieties, which were motivated by Mayer’s remarkable statements for K3 surfaces. We give a criterion for the existence of base divisors for big and nef line bundles on irreducible symplectic varieties. If time permits, we mention some results on base loci in higher codimension.

Gregory Sankaran

Degenerations of hyperkahler manifolds

In the 1970s, Kulikov studied degenerations of K3 surfaces, distinguishing three types. The same three types of degeneration occur for general hyperkahler manifolds but are much less well understood. Most recent work has concentrated on the Type II degenerations. I will describe many of the problems, and a little progress, on Type III degenerations.

Lukasz Sienkiewicz

Vinberg’s X_4 revisited

The subject of the talk is a unique complex K3 surface with maximal Picard rank and with discriminant equal to four. We describe configuration of smooth, rational curves on this surface and identify generators of its automorphisms group with distinguished elements of the Cremona group of \mathbb{P}^2 . This work may be considered as an extension of Vinberg’s research on the subject.

Alessandro Verra

On quasi étale coverings of K3 surfaces and their moduli

The talk deals with K3 surfaces S , suitably polarized in genus g by $H \in \text{Pic } S$, which are quotient of a K3 surface by a symplectic automorphism of order n . In particular it deals with the moduli $\mathcal{P}_{g,n}$ of triples (S, H, C) , $C \in |H|$, and its relations to the moduli $\mathcal{R}_{g,n}$ of étale $n : 1$ covers of curves of genus g . A natural map $r_{g,n} : \mathcal{P}_{g,n} \rightarrow \mathcal{R}_{g,n}$ associates to the moduli point of (S, H, C) the moduli point of the étale cover of C induced by S . This is a variation of the Mukai map

$m_g : \mathcal{P}_g \rightarrow \mathcal{M}_g$, from the moduli \mathcal{P}_g of triples (S, H, C) such that (S, H) is any K3 surface, polarized in genus g , to the moduli of curves of genus g . The cases $n = 2, 3$ are considered. For $n = 3$ the geometry of the standard irreducible component of $\mathcal{P}_{g,3}$ is studied. For $g = 5$, the unirationality of $\mathcal{R}_{5,3}$ is proven using the geometry of $r_{5,3}$ and of $\mathcal{R}_{5,3}$. For $n = 2$ the generic injectivity of $r_{g,n}$, with its exceptions and remarkable analogies to m_g , is described for each irreducible component of \mathcal{P}_g . (Joint works with A. Garbagnati and with A. Knutsen - M. Lelli Chiesa).