Conference Schedule

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
9:00-10:00	Shigeru Mukai	Claire Voisin	Free Discussion	Jun-Muk Hwang	Yaoxiong Wen
10:00-10:30	Tea Break			Tea Break	
10:30-11:30	Alessandra Sarti	Zhi Jiang		Kontantin Shramov	Guolei Zhong
11:30-14:00	Lunch Break			Lunch Break	
14:00-15:00	Meng Chen	Francesco Russo		Samuel Boissière	Free Discussion
15:00-15:30	Tea Break			Tea Break	
15:30-16:30	Yongnam Lee	Michel Brion		Qianyu Chen	
16:30-16:45	Free Discussion	Break		Break	
16:45-17:45		Jaroslaw Wisniewski		Botong Wang	

Titles and Abstracts

Samuel Boissière (Université de Poitiers)

The Fano variety of lines on singular cyclic cubic fourfolds

In the framework of the compactification of the moduli spaces of prime order non-symplectic automorphisms of irreducible holomorphic symplectic manifolds, a key question is to understand the geometry of limit automorphisms. I will present recent results in this direction, using symplectic resolutions of Fano varieties of lines on singular cyclic cubic fourfolds. In my talk, I will focus on the K3 surfaces whose geometric properties are at the heart of the understanding of the limit automorphisms in suitable moduli space parametrizing pairs of IHS manifolds with automorphism. These results have been obtained in collaboration with Chiara Camere, Paola Comparin, Lucas Li Bassi and Alessandra Sarti.

Michel Brion (Université Grenoble Alpes)

Equivariant completion

Given an action of an algebraic group G on a variety X, does there exist a complete G-variety Y containing X as a G-stable open subset? If X is quasi-projective (resp. normal, smooth), can one take Y to be projective (resp. normal, smooth)? Some of these questions have an affirmative answer if G is linear and connected, by results of Sumihiro. The talk will present recent progress for an arbitrary G, with applications to algebraic groups of birational transformations.

Meng Chen (Fudan University)

A lifting principle for canonical stability indices of varieties of general type

For any integer $n > 0$, the n-th canonical stability index r_n is defined to be the smallest positive integer so that the r_n-canonical map Φ_{r_n} is stably birational onto its image for all nonsingular projective n-folds of general type. In this talk, I will explain the main steps towards proving the following conjecture (="lifting principle"): r_n equals to the maximum of the set of those canonical stability indices of smooth projective $(n+1)$-folds with sufficiently large canonical volumes. This is a joint work with Hexu Liu.

Qianyu Chen (University of Michigan)

Minimal exponent and singularities

I will give an introduction to the minimal exponent, an invariant of hypersurface singularities that refines the log canonical threshold. Many important features of the log canonical threshold were extended to the minimal exponent and two classes of singularities, higher Du Bois and higher rational singularities, can be characterized using the minimal exponent. If there will be time at the end we might discuss an extension of this circle of ideas to local complete intersections.

Jun-Muk Hwang (IBS Center for Complex Geometry)

Symmetrizer group of a projective hypersurface

To each projective hypersurface, we associate an abelian linear algebraic group called the symmetrizer group of the corresponding symmetric form. This group describes the set of homogeneous polynomials with the same Jacobian ideal and gives a conceptual explanation of previous results by Ueda-Yoshinaga and Wang. In particular, the diagonalizable part of the symmetrizer group detects Sebastiani-Thom property of the hypersurface and the unipotent part is related to the singularity of the hypersurface.

Zhi Jiang (Fudan University)

TBA

TBA

Yongnam Lee (KAIST and IBS Center for Complex Geometry)

$\mathbb{Q}$-Gorenstein smoothings of rational elliptic surfaces with semi-log-terminal singularities and its applications to surfaces with $p_g = q = 0$

In this talk, I will discuss $\mathbb{Q}$-Gorenstein smoothings of rational elliptic surfaces with semi-log-terminal singularities, and its applications to construction of surfaces with $p_g = q = 0$ and to compactifying moduli of surfaces with $p_g = q = 0$. Particular emphasis will be placed on the ongoing study of Dolgachev surfaces.

Shigeru Mukai (RIMS Kyoto University & MCM, CAS)

Vinberg surface of discriminant 3 and cubic 4-folds with many cusps

Vinberg(1983) studied two K3 surfaces of Picard number 20, and determined the structure of their (infinite) automorphism groups. As a higher dimensional analogue I discuss the birational automorphism groups $\mathrm{Bir}(X)$ of holomorphic symplectic 4-folds. I will explain how the group $\mathrm{Bir}(X)$ enlarges when X becoming from $\mathrm{Vin3}$, one of two Vinberg surfaces, to its Hilbert square $\mathrm{Vin3}^{[2]}$. If time permits I will also discuss some interesting phenomena which we observe when taking mod 3 reduction of these algebraic varieties.

Francesco Russo (University of Catania)

TBA

TBA

Alessandra Sarti (Université de Poitiers)

Recent progress on Enriques manifolds and the Morrison-Kawamata cone conjecture

Enriques manifolds are non simply connected manifolds whose universal cover is irreducible holomorphic symplectic and as such they are natural generalizations of Enriques surfaces. The goal of the talk is from one side to recall the definition of Enriques manifold, to show basic properties and to give examples. On the other hand as an application we will show the Morrison-Kawamanta cone conjecture for Enriques manifolds under some conditions on the group acting on the universal cover. The proof uses lattices theory and properties of automorphisms acting on IHS manifolds. In the last part of the talk we will discuss the cone conjecture for the known exmaples of Enriques manifolds. This is a joint work with Gianluca Pacienza.

Kontantin Shramov (Steklov Mathematical Institute & NRU Higher School of Economics)

Conic bundles

Consider a conic bundle over a smooth incomplete curve C, i.e. a smooth surface S with a proper surjective morphism to C such that the push-forward of the structure sheaf of S coincides with the structure sheaf of C, and the anticanonical class of S is ample over C. If the base field is perfect, a conic bundle always extends to a conic bundle over a completion of C. I will tell about a necessary and sufficient condition for the existence of such an extension in the case of an arbitrary base field. The talk is based on a joint work in progress with V.Vologodsky.

Claire Voisin (Sorbonne Université & Université Paris Cité)

On the smoothability of cycles in the Whitney range

We prove that for any smooth projective variety X over a field of characteristic 0, any cycle of dimension d on X can be written modulo rational equivalence as an integral combination of classes of smooth subvarieties, assuming the Whitney condition $2d < \dim X$. This follows from a more general theorem: any cycle (of any dimension) on X can be obtained by pushing-forward a product of divisors on a smooth projective variety Y under a flat projective morphism $Y \to X$. This is joint work with J. Kollár.

Botong Wang (University of Wisconsin-Madison)

Singer-Hopf conjecture for projective varieties

One form of the Singer-Hopf conjecture says that if the universal cover of a closed $2d$-dimensional real manifold M is contractible, then the Euler characteristics of M satisfies $(-1)^d \chi(X) \geq 0$. In joint works with Liu, Maxim and Arapura, we conjectured that if a projective manifold X has large fundamental group, then the Euler characteristic of any perverse sheaf on X is nonnegative. This vastly generalizes the above Singer-Hopf conjecture for projective manifold. I will discuss some recent progress on the new conjecture using ideas from nonabelian Hodge theory and Shafarevich conjecture (that the universal cover of a projective manifold is holomorphically convex).

Yaoxiong Wen (Korea Institute for Advanced Study)

Mirror symmetries for parabolic Hitchin systems, from classical to global

We study the parabolic Hitchin systems under the Langlands dual, focusing on types B and C. We aim to understand the SYZ and topological mirror symmetries for the Langlands dual parabolic Hitchin systems. We find three levels of dualities/symmetries:

1. *Classical level* deals with the parabolic structures, which relate to nilpotent orbits. The duality here is the Springer dual.
2. *Local level* plays a crucial role; it serves as a bridge between the classical level and the global level. It deals with affine Spaltenstein fiber; the symmetry here is Lusztig's canonical quotient.
3. *Global level* deals with the moduli space of parabolic Higgs bundles. Mirror symmetries here are SYZ and topological mirror symmetries.

This talk is partly based on the joint work with B. Fu and Y. Ruan (arXiv:2207.10533) and the joint work with B. Wang, and X. Wen (arXiv:2403.07552).

Jaroslaw Wisniewski (University of Warsaw)

TBA

TBA

Guolei Zhong (IBS Center for Complex Geometry)

Canonical heights for abelian group actions of maximal dynamical rank

Let X be a smooth projective variety of dimension $n \geq 2$ and G an abelian subgroup of automorphisms of X over $\bar{\mathbb{Q}}$. Suppose that G is of positive entropy. It was proved by Dinh and Sibony that G is then free abelian of rank no more than $n-1$. In the past decade, from the viewpoints of algebraic dynamics, the geometry of the extremal case $\mathrm{rank}(G) = n-1$ (being maximal) has been intensively studied by Zhang. In this talk, we study the maximal rank case in the aspect of arithmetic dynamics. More precisely, we construct a canonical height function $\widehat{h}_G$ associated with G, corresponding to a nef and big $\mathbb{R}$-divisor, satisfying the Northcott property. By characterizing its null locus, we prove the Kawaguchi--Silverman conjecture for each

element of G. As applications, we determine the height counting function for non-periodic points of such a dynamical system and study the potential density of the underlying space. This is based on a joint work with Fei Hu.