Algebraic Geometry on Cyprus

2–6 November 2026

Grecian Park Hotel, Cyprus

Titles and abstracts

Theodosis Alexandrou

A surface with representable CH_0*-group but no universal zero-cycle*

We introduce a new obstruction to the existence of a universal 0-cycle on a smooth projective complex variety. As an application, we construct a smooth projective complex surface whose Chow group of 0-cycles is representable but which does not admit a universal 0-cycle. This provides a two-dimensional analogue of Voisin's recent threefold counterexample to a question of Colliot-Thelene. As a further consequence, we exhibit the first example of a smooth projective threefold of Kodaira dimension zero for which the integral Hodge conjecture fails modulo torsion. The construction relies on the geometry of bielliptic surfaces of type 2.

Ekaterina Amerik

Birational geometry of hyperkahler manifolds in codimension two

It is known since Wierzba-Wisniewski's work in 2003 that a birational map between holomorphic symplectic fourfolds is a composition of Mukai flops. Hu and Yau conjectured that in any dimension, a birational map is a composition of Mukai elementary transformations in codimension two, that is, maps which locally look like a product of a 4-dimensional flop with the identity on a polydisc, "up to codimension three or higher". Call a birational map f from X to X' a "Hu-Yau transformation", if there are proper closed subsets Z, Z' of codimension three or higher such that f induces a Mukai transformation in codimension two between $X \setminus Z$ and $X' \setminus Z'$. We show that any birational map between irreducible holomorphic symplectic manifolds is a product of Hu-Yau transformations, and give an example showing that a stronger version of the conjecture cannot be true: it is not possible to decompose a given map into a product of Mukai elementary transformation after discarding some codimension three closed subsets from the source and the target. Joint work with A. Soldatenkov and M. Verbitsky.

Meirav Amram

Algebraic Surfaces and Curves with New Results on Zariski Pairs

This talk explores topological invariants in algebraic geometry, balancing two core topics: algebraic curves and algebraic surfaces. First, we examine algebraic curves, looking at Zariski pairs in conic-line arrangements and combining theoretical constructions with algorithms to study fundamental groups. Next, we shift to algebraic surfaces, using surface degenerations and projections onto the projective plane to investigate their fundamental groups and Galois covers.

Nero Budur

An update on archimedean, birational, and motivic zeta functions

In this talk we present an overview of recent results on archimedean, birational, and motivic zeta functions related to singularities.

Jungkai Chen

On weighted projective spaces admitting $\mathbb{Q}$*-Gorenstein smoothing to* $\mathbb{P}^3$ *and Fano manifolds*

There are two known infinite families of weighted projective threefolds that admits a $\mathbb{Q}$-Gorenstein smoothing to projective threefolds, which arise from deformations of projective space and quadrics respectively. In the recent joint works with Yongnam Lee, we investigate some numerical conditions as well as geometric conditions. Based on these conditions, we constructed some new examples. Also, we prove some partial results toward to the complete classification on degenerations of projective spaces.

Alessandro Chiodo

The double ramification class via Grothendieck-Riemann-Roch

Given a family of smooth curves $C \to S$ and a line bundle L on C, it is natural to study the locus of points x in S for which L_x is trivial on C_x. In the smooth case, this locus admits a cycle-theoretic description that can be studied using Grothendieck–Riemann–Roch. For families of stable curves, however, the naive definition no longer extends over all of S. The double ramification cycle is the virtual cycle that provides the correct extension. This problem is closely analogous to the construction of a Néron model of the Jacobian Pic^0 of a smooth curve over the moduli space of stable curves, replacing the classical local approach over a DVR by a global one. In 2014, inspired by Michel Raynaud's local theory, David Holmes proposed a construction of a global Néron model over a birational logarithmic modification of the moduli space of curves; related ideas were developed further by Holmes, Marcus, and Wise. I will explain how the logarithmic point of view leads to enumerative consequences, focusing in particular on the Hodge–DR conjecture, in joint work with David Holmes.

Taylor Dupuy

PCF All The Way Down

Let $f\colon X \to X$ be a finite surjective map on varieties over a field k of characteristic zero. We say it is post critically finite (PCF) if the forward orbit of its (divisorial) critical locus is an algebraic variety. The PCF All The Way Down Conjecture stated that if f is PCF and if D is a divisor such that $f(D) = D$ then f restricted to D is also PCF. (More generally a statement holds for pre-periodic D). We will prove this conjecture and discuss its generalizations and applications to questions about ramification of inverse image fields. This is joint work with Tom Tucker, Alon Levi, and Zhuoran Wang. The result is AI work finishing a long term pre-AI project. There is a long AI methods story that comes with this result which I may or may not talk about.

Matej Filip

Scattering diagrams and toric deformations

We explain how mutations of Laurent polynomials in two variables give rise to explicit deformations of three-dimensional affine toric varieties. Our construction uses the Gross–Hacking–Keel–Kontsevich scattering diagram framework and provides new insight into a conjecture describing the irreducible components of deformation spaces of toric varieties. This is joint work with Tim Graefnitz.

Ludmil Katzarkov

Conic Bundles del Pezzo Fibrations and atoms

In this talk we will discuss an approach to nonrationality of classical Mori fibrations through atoms.

Tatsuro Kawakami

Endomorphisms of varieties and Bott vanishing

We prove that normal projective varieties admitting int-amplified endomorphisms satisfy Bott vanishing. As an application, we give an alternative proof of the fact that the only smooth Fano threefold admitting a nontrivial endomorphism is $\mathbb{P}^3$. This is joint work with Burt Totaro. If time permits, I will also discuss a local analogue of our results.

In-Kyun Kim

G_a-rigidity of four-dimensional Brieskorn–Pham hypersurfaces

We study the G_a-rigidity of four-dimensional affine Brieskorn–Pham hypersurfaces, namely the absence of nontrivial algebraic actions of the additive group. Our approach relates this problem to the existence of cylinders in the associated weighted projective threefolds. We investigate the geometry of these varieties using log canonicity and degeneration techniques. Our aim is to establish rigidity criteria for explicit families and to develop a systematic approach that goes beyond case-by-case analysis.

Boris Kunyavskii

Birational properties of word varieties

We prove that the subvariety of $\mathrm{SL}(2) \times \mathrm{SL}(2)$ given by the matrix equation $w(X, Y) = g$, where w is a word in two letters, is closely related to an explicit smooth conic bundle over the associated 'trace surface' in the 3-dimensional affine space. When w is the commutator word, we show that this variety can be irrational if the ground field k is not algebraically closed, answering a question of Rapinchuk, Benyash-Krivetz, and Chernousov. When k is a number field, it satisfies weak approximation with the Brauer–Manin obstruction. The talk is based on our joint work with Tatiana Bandman and Alexei Skorobogatov.

Adrian Langer

Stability of vector bundles and reduction mod p

The main aim of the talk is to study the behaviour of vector bundles on normal complex projective varieties under reduction modulo primes. I will discuss a generalization of Shepherd–Barron's theorem relating failure of strong semistability of rank-two bundles in positive characteristic to projective unitary flatness in characteristic zero. In arbitrary rank, if the second symmetric power of a vector bundle is slope stable, a Zariski dense set of reductions that are not strongly geometrically stable forces projective unitary flatness. In ranks two and three, stability of the bundle itself suffices, whereas a rank-four counterexample shows that additional assumptions are necessary in higher rank. The proof combines Frobenius techniques, algebraic holonomy, and positivity on associated homogeneous bundles.

Gebhard Martin

The Enriques surface of minimal entropy

Salem numbers appear naturally as dynamical degrees of isometries of hyperbolic lattices and hence in the study of entropy of surface automorphisms. The conjecturally smallest Salem number is Lehmer's number λ_{10}, which can be realized by automorphisms of K3 surfaces and rational surfaces by work of McMullen. In this talk, I will explain how to generalize a result of Oguiso asserting the non-realizability of λ_{10} for automorphisms of Enriques surfaces over the complex numbers to odd characteristics. Then, I will describe the unique counterexample in characteristic 2. This is joint work with Giacomo Mezzedimi and Davide Veniani.

Yuya Matsumoto

Uniform regularity of torsors by finite commutative group schemes

Let G be a finite commutative group scheme (possibly non-reduced). Suppose (X, x) and (Y, y) are local schemes and $(Y, y) \to (X, x)$ is a local G-torsor (which means roughly that $Y \setminus \{y\} \to X \setminus \{x\}$ is a G-torsor). We prove that if (Y', y') is a local G-torsor that is (Y, y) plus a torsor (which can be nontrivial only if G is non-reduced), then Y and Y' have isomorphic tangent cones. In particular, Y is regular if and only if Y' is regular. A corollary is that if G is non-reduced then G-quotient singularities admit infinitely many regular G-covers.

James McKernan

Bend and break without tears

I will describe my understanding of a recent paper on the arXiv by Guo and Xie. The paper gives an algebraic construction of rational curves, under the usual hypothesis that there is a curve C in the smooth locus such that $K_X \cdot C < 0$, without reduction modulo p. The proof relies heavily on the use of AI.

Fedor Pakovich

On intersections of fields of rational functions

Let X and Y be rational functions of degree at least two with complex coefficients such that $\mathbb{C}(X, Y) = \mathbb{C}(z)$. We study the problem of determining when the field extension $[\mathbb{C}(z) : \mathbb{C}(X) \cap \mathbb{C}(Y)]$ is finite and attains the minimal possible degree $\deg X \cdot \deg Y$. We give a complete characterization in the case where X is a Galois covering, and establish several related results.

Miles Reid

The general Godeaux curve

A simple construction in projective geometry provides the polarised curves (C, A) that can appear as fibres of the 2-canonical pencil $|2K_S|$ on a Godeaux surface S (under generality assumptions). The surfaces themselves are work in progress.

Stefan Schröer

K3 surfaces over small number fields and Kummer construction in families

We construct K3 surfaces over certain S_3-number fields that have good reduction everywhere. To this end we develop a theory of Kummer constructions in families, based on Romagny's notion of the effective models, here applied to sign involutions. This includes quotients of non-normal surfaces by infinitesimal group schemes in characteristic two, as developed by Kondo and myself. By the results of Brieskorn and Artin, the resulting families of normal K3 surfaces admit simultaneous resolutions of singularities, at least after suitable base changes. These resolutions are constructed in two ways: First, by blowing-up families of one-dimensional centers that acquire embedded components. Second, by computing various ℓ-adic local systems in terms of representation theory and invoking Shepherd-Barron's results on the resolution functor, a highly non-separated algebraic space.

Yuri Tschinkel

Geometry over BG

I will discuss new constructions in equivariant birational geometry.

Christian Urech

Characterizing varieties using their groups of birational transformations

We look at the following question: Let X and Y be complex varieties such that $\mathrm{Bir}(X)$ is isomorphic to $\mathrm{Bir}(Y)$ as an abstract group, must X and Y be birational? We will see that the answer is yes — up to an automorphism of the base-field — if X is a ruled variety. In particular, the group structure of $\mathrm{Bir}(X)$ determines whether X is rational. This is joint work with L. Esser, N. Chen, A. Regeta, and I. van Santen.