

# Fano varieties in Obihiro

- Date: June 22 – June 26, 2026  
<https://webhomes.maths.ed.ac.uk/cheltsov/obihiro/index.html>
- Venue: Tokachikan (Room: Tancho-no-ma) とかち館, 丹頂の間  
Minamisp6, Nishisp7-2, Obihiro, Hokkaido (北海道帯広市西7条南6丁目2番地)  
<https://www.tokachikan.jp/english/>

## Program

22nd (Mon.)

9:30–10:30 Evgeny Shinder (University of Sheffield)

Categorical resolutions of  $cA_1$  singularities

10:50–11:50 Jihun Park (IBS Center for Geometry and Physics and POSTECH)

Automorphism groups of smooth Fano 3-folds in Family 2-16

13:40–14:40 Enrica Floris (Université de Poitiers)

Compactifications of the affine 4-space by Mori fibrations over  $\mathbb{P}^1$

15:00–16:00 Konstantin Shramov (HSE University)

Intersection of two quadrics

16:20–17:20 Jungkai Chen (National Taiwan University)

Deformation of hypersurfaces of even degree in  $\mathbb{P}^3$  and moduli spaces of threefolds of general type

23rd (Tue.)

9:30–10:30 Kristin DeVleming (University of California San Diego)

K-stability of general complete intersections

10:50–11:50 Yoshinori Gongyo (The University of Tokyo)

Mukai type conjecture

13:40–14:40 Kenneth Ascher (University of California, Irvine)

Geometry of moduli stacks of plane curves

15:00–16:00 Frédéric Mangolte (Aix-Marseille Université)

On  $G$ -birational rigidity of projective spaces

16:20–17:20 Nicolas Addington (University of Oregon)

Integral cohomology of some hypersurfaces via real loci

24th (Wed.)

9:30–10:30 Adrien Dubouloz (Université Bourgogne-Europe and Université de Poitiers)

An enriched discount of lines on del Pezzo surfaces

10:50–11:50 Paolo Cascini (Imperial College London)

On Foliated Flops on a Threefold

25th (Thu.)

9:30–10:30 Yuchen Liu (Northwestern University)

Optimal bounds for local volumes of threefold singularities

10:50–11:50 Akihiro Kanemitsu (Tokyo Metropolitan University)

Fano 3-folds with Picard rank one and large automorphism group in positive characteristic

13:40–14:40 Sho Tanimoto (Nagoya University)

Manin's conjecture for semi-integral curves and  $\mathbb{A}^1$ -connectedness

15:00–16:00 Pedro Montero (Universidad Técnica Federico Santa María)

Étale motivic cohomology of some Fano fivefolds

16:20–17:20 Anne-Sophie Kaloghiros (Brunel University London)

On K-moduli of prime Fano threefolds of genus 12

26th (Fri.)

9:30–10:30 Hiromichi Takagi (Gakushuin University)

Construction and characterization of prime  $\mathbb{Q}$ -Fano 3-folds via key varieties

10:50–11:50 Lena Ji (University of Illinois Urbana-Champaign)

Degree two rational multisections of conic bundles

12:10–13:10 Taro Sano (Kobe University)

On K-stability of Fano weighted hypersurfaces

	<b>22nd (Mon)</b>	<b>23rd (Tue)</b>	<b>24th (Wed)</b>	<b>25th (Thu)</b>	<b>26th (Fri)</b>
9:30–10:30	Shinder	DeVleming	Dubouloz	Liu	Takagi
10:50–11:50	Park	Gongyo	Cascini	Kanemitsu	Ji
13:40–14:40	Floris	Ascher	(Discussion)	Tanimoto	Sano
15:00–16:00	Shramov	Mangolte		Montero	(12:10–13:10)
16:20–17:20	Chen	Addington		Kaloghiros	(Discussion)

## Abstracts

**Evgeny Shinder** (University of Sheffield)

Title: **Categorical resolutions of  $cA_1$  singularities**

It is expected that singular varieties should admit unique minimal categorical resolutions, and that those resolutions should be, in some sense, crepant. This fundamental question is quite difficult already for threefolds. I will explain how to construct weakly crepant resolutions, in the sense of Kuznetsov, in the simplest case of compound  $A_1$  singularities  $x^2 + y^2 + z^2 + w^n = 0$ . The construction depends on whether  $n$  is even or odd. In the case of even  $n$ , the categorical resolution is equivalent to the small resolution, when the latter exists globally, and we rediscover Reid's pagoda. When  $n$  is odd, there is no small geometric resolution, and the categorical resolution we construct should be thought of as an appropriate replacement, together with a noncommutative version of the pagoda. These results generalize the work of Kuznetsov ( $n = 1$ ), as well as Kawamata and Fietz ( $n = 2$ ). This is joint work in progress with Yajnaseni Dutta and Celine Fietz.

**Jihun Park** (IBS Center for Geometry and Physics and POSTECH)

Title: **Automorphism groups of smooth Fano 3-folds in Family 2-16**

A smooth Fano 3-fold in Family 2-16 is obtained by blowing up a smooth complete intersection of two quadrics in  $\mathbb{P}^5$  along a conic. This variety was constructed and studied by Gino Fano in a paper published three years before his death. For this reason, Marco Andreatta and Roberto Pignatelli dubbed it *Fano's Last Fano*. In this talk, we classify all groups that can occur as automorphism groups of Fano's Last Fanos, using a classical result on semi-invariant binomials.

**Enrica Floris** (Université de Poitiers)

Title: **Compactifications of the affine 4-space by Mori fibrations over  $\mathbb{P}^1$**

Compactifications of the affine space by minimal varieties are classified in low dimension. In dimension 2 the only compactification with Picard rank one is the projective plane, while in dimension 3 all the configurations were classified by Furushima. The case of dimension at least 3 and Picard rank 2 has been studied in several papers from different view points by Kishimoto, Dubouloz, Nagaoka, Palka. In this talk we will report on recent developments on completions of the affine space of dimension 4 by a Mori fibration with general fiber a smooth Fano threefold. This is a work in progress in collaboration with Pedro Montero.

**Konstantin Shramov** (HSE University)

Title: **Intersection of two quadrics**

I will talk about the birational geometry of del Pezzo surfaces of degree 4, that is, smooth intersections of two quadrics. In particular, we will discuss a classification of their birational models, and properties of birational automorphism groups.

**Jungkai Chen** (National Taiwan University)

Title: **Deformation of hypersurfaces of even degree in  $\mathbb{P}^3$  and moduli spaces of threefolds of general type**

Threefolds of general type with small invariants usually admits double cover over  $\mathbb{P}^3$  or  $\mathbb{P}^1$ -bundle over Hirzebruch surfaces. With this motivation in mind, we consider the deformation of the pairs of  $\mathbb{P}^3$  and hypersurfaces of even degree. Similarly, we study pairs of  $\mathbb{P}^1$ -bundle over  $\mathbb{P}^2$  or Hirzebruch surfaces. Additionally, we explore some aspects of moduli spaces of threefolds of general type with small invariants through the double cover method. This talk is based on the joint work with Yongnam Lee and Phin-Sing Soo.

**Kristin DeVleming** (University of California San Diego)

Title: **K-stability of general complete intersections**

We prove that a general Fano complete intersection of any multidegree and dimension is K-stable (unless it is  $\mathbb{P}^n$  or a quadric, in which case it is K-polystable). We recover several known results on K-stability of complete intersections with this method, such as the K-stability of every smooth complete intersection of two quadrics. This is joint work with Livia Campo, Tiago Duarte Guerreiro, and Yijue Hu.

**Yoshinori Gongyo** (The University of Tokyo)

Title: **Mukai type conjecture**

I will report the recent progress of Mukai type conjecture which gives a characterization of product of projective spaces by using a variant of Shokurov's complexity. This is based on working with Joshua Enwright, Stefano Filipazzi, Joaquin Moraga, Roberto Svaldi, Chengxi Wang, Kiwamu Watanabe.

**Kenneth Ascher** (University of California, Irvine)

Title: **Geometry of moduli stacks of plane curves**

There are now several compactifications of the moduli space of plane curves (KSBA, GIT, K-moduli, etc.) which can be unified via "wall-crossing". We will review this picture through the example of quartics, and discuss how we can build upon these ideas to compute the Chow and cohomology rings of these moduli stacks. This talk is based on joint work with Donggun Lee.

**Frédéric Mangolte** (Aix-Marseille Université)

Title: **On  $G$ -birational rigidity of projective spaces**

We study finite subgroups  $G$  of  $\mathrm{PGL}_{n+1}$  such that the projective space  $\mathbb{P}^n$  is  $G$ -birationally rigid. Over the complex numbers, we prove that for each  $n \geq 3$  there are only finitely many such subgroups up to conjugacy. Over the real numbers, we classify all such  $G$  for  $n = 2, 3$ , and prove that no such  $G$  exists for  $n = 4, 5, 6$ .

**Nicolas Addington** (University of Oregon)

**Title: Integral cohomology of some hypersurfaces via real loci**

For a smooth hypersurface in projective space, Griffiths' residue calculus describes the middle cohomology with coefficients in the complex numbers, but the cohomology with integer coefficients is harder to understand, especially when the dimension is odd. Walcher discovered, and I rediscovered, that for Fermat hypersurfaces of odd dimension and degree, the middle cohomology is generated by the Poincaré dual of the real locus, together with its orbit under the action of the automorphism group. For Klein hypersurfaces, the situation is more complicated, as I will discuss.

**Adrien Dubouloz** (Université Bourgogne-Europe and Université de Poitiers)

**Title: An enriched discount of lines on del Pezzo surfaces**

Recent years have seen a rapid development in the exploration of quadratic enrichments of classical enumerative problems in algebraic geometry over arbitrary fields. A particularly notable instance is the construction of a motivic count of lines on a smooth cubic surface—taking values in the Grothendieck-Witt group of the base field—introduced by Kass and Wickelgren; this constitutes a natural extension of the signed count of real lines on such surfaces, as discovered by Segre and Finashin-Kharlamov. In this talk, I will provide an introduction to the background and motivic methods used to construct (and sometimes compute) quadratic enrichments of certain enumerative problems. I will then explain in greater detail two contrasting recent results by Victor Chachay regarding the quadratically enriched counts of lines on del Pezzo surfaces of degrees 2 and 5.

**Paolo Cascini** (Imperial College London)

**Title: On Foliated Flops on a Threefold**

Flops are one of the central operations in the Minimal Model Program, connecting different minimal models by crepant birational transformations. In this talk I will discuss recent results on the analogous questions for foliations on a threefold, focusing on the contrast between co-rank one and rank one foliations. Joint work with R. Mascharak and C. Spicer.

**Yuchen Liu** (Northwestern University)

**Title: Optimal bounds for local volumes of threefold singularities**

We establish an optimal upper bound for local volumes of Gorenstein canonical non-hypersurface threefold singularities. Specifically, we show that a klt threefold singularity with local volume at least 9 is either a hypersurface singularity or a quotient singularity. As applications, we obtain new restrictions on the singularities of members in K-moduli spaces of Fano threefolds, and we establish a sharp inequality between local volumes and minimal log discrepancies for threefold singularities.

**Akihiro Kanemitsu** (Tokyo Metropolitan University)

**Title: Fano 3-folds with Picard rank one and large automorphism group in positive**

## **characteristic**

I will discuss the classification of quintic del Pezzo 3-folds and prime Fano 3-folds of genus 12 in positive characteristic. Specifically, I will provide (1) the classification of quintic del Pezzo 3-folds by non-degenerate ternary symmetric bilinear forms, and (2) the classification of prime Fano 3-folds of genus 12 with large automorphism groups in positive characteristic. (joint work with Tetsushi Ito, Teppei Takamatsu, Yuuji Tanaka)

**Sho Tanimoto** (Nagoya University)

Title: **Manin's conjecture for semi-integral curves and  $\mathbb{A}^1$ -connectedness**

First we discuss an unexpected connection between Manin's conjecture for integral points and  $\mathbb{A}^1$ -connectedness. Then we discuss Manin's conjecture for semi-integral curves on toric varieties. Our counting method is geometric in nature, and it explains a mysterious leading constant of Manin's conjecture for Campana points proposed by Chow, Loughran, Takloo-Bighash and the speaker. This is joint work with Qile Chen and Brian Lehmann.

**Pedro Montero** (Universidad Técnica Federico Santa María)

Title: **Étale motivic cohomology of some Fano fivefolds**

I will review the Chow and étale motivic cohomology groups of smooth, complete intersections with Hodge structures of level one, as classified by Deligne and Rapoport. I will pay particular attention to fivefolds and explain how the comparison map between Chow and étale motivic cohomology interacts with the birational properties of such varieties. I will show how these results can be extended to algebraic cycles on other smooth Fano manifolds with Hodge structures of level one. Finally, I will present some preliminary results regarding the comparison map for certain Fano manifolds of Calabi–Yau type, focusing particularly on double quartic fivefolds. I will pay special attention to their unramified cohomology groups with torsion coefficients and the integral Hodge conjecture. These results are based on ongoing work with Ivan Rosas-Soto (Université de Strasbourg).

**Anne-Sophie Kaloghiros** (Brunel University London)

Title: **On K-moduli of prime Fano threefolds of genus 12**

Over the past decade, much progress has been made in understanding explicit K-stability of smooth Fano threefolds. We now know which of the 105 deformation families of smooth Fano 3-folds correspond to a non-empty K-moduli space and have a complete description of these K-moduli spaces in many cases. Current techniques however do not tell us much about K-moduli spaces of prime Fano threefolds. An especially interesting case is that of prime Fano threefolds of genus 12 ( $V_{22}$ ). While the general Fano of type  $V_{22}$  is K-stable, some strictly K-semistable examples are known. In this talk, I will describe the boundary of the K-moduli stack of Fano threefolds of type  $V_{22}$ .

**Hiromichi Takagi** (Gakushuin University)

**Title: Construction and characterization of prime  $\mathbb{Q}$ -Fano 3-folds via key varieties**

The online database of  $\mathbb{Q}$ -Fano 3-folds is expected to capture the overall landscape of them. Previous works have shown that, for prime  $\mathbb{Q}$ -Fano 3-folds of codimension at most four, examples have been constructed for almost all families listed in the database. In these constructions, methods using key varieties have played an important role.

In this talk, I will present some of my results on the codimension four case. Furthermore, I will discuss several families of prime  $\mathbb{Q}$ -Fano 3-folds with only  $1/2(1, 1, 1)$ -singularities for which characterizations via key varieties are possible without assuming a bound on the codimension.

**Lena Ji** (University of Illinois Urbana-Champaign)

**Title: Degree two rational multisections of conic bundles**

The Enriques criterion for unirationality of conic bundles states that if  $X$  is a conic bundle over  $\mathbb{P}^2$ , then  $X$  is unirational if and only if the conic bundle admits a rational multisection. Furthermore, if  $X$  is unirational but not rational, then such a rational multisection necessarily has even degree. In this talk, we study non-existence of degree 2 rational multisections. This is joint work in progress with Jeffrey Diller and Eric Riedl.

**Taro Sano** (Kobe University)

**Title: On K-stability of Fano weighted hypersurfaces**

K-stability of explicit Fano varieties has been extensively studied in recent years. Stability thresholds (or Delta invariants) provide an effective criterion for detecting K-stability of Fano varieties. Moreover, Abban–Zhuang developed a powerful approach to computing stability thresholds via adjunction for divisors over varieties. In this talk, I will explain our recent results on the K-stability of certain Fano weighted hypersurfaces obtained using the Abban–Zhuang method. This is joint work with Campo, Fujita, and Tasin.

**Organizers:** Hamid Abban (University of Nottingham), Ivan Cheltsov (University of Edinburgh), Kento Fujita (Osaka University), Takashi Kishimoto (Saitama University), Takuzo Okada (Kyushu University)

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