

## Abstracts Workshop

**Manuel Blickle**

**Title:** Bernstein-Sato polynomials for test modules

**Abstract:** In complex geometry, through the work of Budur and Saito, a close relationship between the multiplier ideal filtration and the D-module-theoretic V-filtration of Kashiwara and Malgrange is known. In positive characteristic Mustata showed that by using higher Euler operators one can mimic parts of this to define an analogue of the V-filtration in this case. His V-filtration restricts to the test-ideal filtration in this setting. In my talk I will report on joint work with Axel Stäbler showing that more generally the test-module filtration for Cartier modules also has an analogous right D-module theoretic interpretation in terms of higher Euler operators.

**Paolo Cascini**

**Title:** Topological bounds in birational geometry

**Abstract:** Many birational invariants of a smooth projective three-fold, such as the number and the singularities of its minimal models, are related with the topology of the underlying manifold. Using these methods, I will discuss some recent progress towards a question by Hirzebruch on the Chern numbers of a smooth projective threefold.

**Yoshinori Gongyo**

**Title:** Versions of injectivity and extension theorems

**Abstract:** We give an analytic version of the injectivity theorem by using multiplier ideal sheaves, and study some extension theorems for the adjoint bundle of dlt pairs. Moreover we obtain some results of semi-ampleness related to the abundance conjecture in birational geometry and the Strominger-Yau-Zaslow conjecture for Hyperkähler manifolds. This is joint work with Shin-ichi Matsumura.

**János Kollár**

**Title:** Maps between local Picard groups

**Abstract:** Let  $X$  be a scheme and  $x \in X$  a point. The local Picard group of  $X$  at  $x$ , denoted by  $\text{Pic}(x, X)$ , is the Picard group of the punctured neighborhood of  $x$ . For an isolated, normal singularity  $(x, X)$  the local Picard group is isomorphic to the divisor

class group of the local ring. Our aim is to study the pull-back map on the local Picard group in two situations.

[Normalization] Let  $\pi: \bar{X} \rightarrow X$  denote the normalization and  $\bar{x}_i \in \bar{X}$  the reduced preimages of  $x$ . What is the kernel of the pull-back map

$$\pi^*: \text{Pic}(x, X) \rightarrow \sum_i \text{Pic}(\bar{x}_i, \bar{X})?$$

[Restriction to a divisor] Let  $x \in D \subset X$  be an effective Cartier divisor. What is the kernel of the restriction map

$$r_D^X: \text{Pic}(x, X) \rightarrow \text{Pic}(x, D)?$$

### Sándor Kovács

**Title:** Higher direct images of logarithmic canonical sheaves

**Abstract:** The main result of the talk is an extension to the logarithmic setting of a (relatively) recent vanishing result of Chatzistamatiou and Rülling which may be considered a Grauert–Riemenschneider type vanishing theorem. This logarithmic result is motivated by an application to the theory of rational pairs and thrifty resolutions in arbitrary characteristics.

### Zhiyu Tian

**Title:** Weak approximation of cubic surfaces over global fields

**Abstract:** Given a smooth cubic surface defined over a number field or the function field of a smooth curve over a finite field, the local-global principle asks what is the image of the set of rational points in the set of adelic points. In this talk I will discuss some partial answers to this question.

### Orlando Villamayor

**Title:** Equimultiplicity, algebraic elimination, and blowing up

**Abstract:** Given a variety  $X$  over a field  $k$ , the multiplicity at  $x \in X$  is related with the local construction of finite morphisms to regular varieties. In other words, in viewing  $(X, x)$  as a ramified cover of a regular space.

One can stratify a variety  $X$  according to the multiplicity, by considering the set of points with the same multiplicity.

We shall draw special attention to this stratification of  $X$ : its behavior when blowing up regular centers included in an equimultiple stratum, and to the compatibility of these blow ups with finite morphisms.

So the classical notions of finite extensions of rings and integral closure of ideals will be the guideline in this talk.

Firstly we shall outline the connection between multiplicity and resolution of singularities, when the underlying field  $k$  is of characteristic zero, and later we shall also discuss about some invariants attached to the multiplicity in arbitrary characteristic.

## **Chenyang Xu**

**Title:** Maximal order pole of motivic zeta function

**Abstract:** We prove a conjecture of Veys, which says that the opposite of the log canonical threshold is the only possible pole of maximal order of the motivic zeta function associated with an effective divisor  $D$  on a smooth variety  $X$  over a field of characteristic zero. If time permits, we will also discuss how to apply our method to study a family of Calabi-Yau varieties and prove properties for the weight function associated with a degeneration. This is joint work with Johannes Nicaise.