

CONFERENCE IN HONOUR OF ALEXEY BONDAL'S 60TH BIRTHDAY

December 15–17, 2021

Steklov Mathematical Institute of Russian Academy of Sciences

All times are given in **Moscow time zone**

(JST +6 hours, CET –2 hours, GMT –3 hours, PDT –11 hours)

December 15, Wednesday

11.00–12.00	M. Kapranov	Zoom
12.15–13.15	M. Van den Bergh	Zoom
15.30–16.30	A. Vishik	Zoom
17.00–18.00	A. Polishchuk	Zoom

December 16, Thursday

11.00–12.00	B. Keller	Zoom
12.15–13.15	M. Kontsevich	Zoom
15.30–16.30	V. Lunts	Room 104
17.00–18.00	A. Rosly	Room 104

December 17, Friday

11.00–12.00	Sh. Okawa	Zoom
12.15–13.15	A. Bodzenta	Zoom
16.15–17.15	A. Efimov	Room 104
17.30–18.30	V. Shokurov	Room 104

Titles and abstracts

Agnieszka Bodzenta (University of Warsaw)

Weakly localising subcategories of coherent sheaves and isomorphisms in codimension two

I will consider a weakly localising Serre subcategory B in an abelian category A , i.e. a Serre subcategory such that the quotient A/B admits a torsion pair with the torsion-free part equivalent to the category E of B -closed objects. I will give sufficient conditions for B to be weakly localising in terms of torsion-tilting chains in A . I will also argue that T -consistent pairs of t-structures of amplitude 2 are equivalent to (strongly) torsion-tilting chains. Given a scheme X of dimension n , the derived category $D(X)$ admits a T -consistent pair of t-structures of amplitude n which yields a pair of amplitude 2. As a result, the category $\text{Coh}_2(X)$ of sheaves supported in codimension 2 is weakly localising. I will prove that, under additional assumptions on X , the additive category $E_2(X)$ of locally $\text{Coh}_2(X)$ -closed objects allows us to reconstruct X up to an isomorphism outside of codimension 2. For a normal surface X I will construct its final model X' from the additive category $E_2(X)$. I will argue that X admits an open embedding into X' with complement of codimension two and I will give conditions under which X is isomorphic to X' . This is based on a joint work with A. Bondal.

Alexander Efimov (Steklov Mathematical Institute)

Mittag-Leffler inverse systems of DG categories

We will introduce a certain class of sufficiently nice inverse systems of DG categories, which we call (secondary) Mittag-Leffler systems. The basic examples are given by the formal schemes and their noncommutative generalization. It can be shown that for ML systems a certain non-standard inverse limit (in the dualizable world) has a reasonable description, and it generalizes the category of nuclear modules. Moreover, we expect that for ML systems the K-theory commutes with inverse limits.

Mikhail Kapranov (IPMU)

Euler continuants, N -spherical functors and periodic semi-orthogonal decompositions

Euler continuants are polynomials giving the universal numerators and denominators of finite continued fractions whose coefficients are independent variables. Remarkably, they admit categorical lifts which are certain complexes of functors obtained from iterated adjoints of a single functor. The totalizations of these complexes can be seen as higher analogs of spherical twists and cotwists. They lead to the concept of N -spherical functors which correspond to N -periodic semi-orthogonal decompositions (usual spherical functors are obtained for $N = 4$). Joint work in progress with T. Dyckerhoff and V. Schechtman.

Bernhard Keller (Université de Paris)

Group actions on cluster categories from Ginzburg morphisms

Chris Fraser has discovered a natural birational action of the extended affine braid group on d strands on the Grassmannian of k -dimensional subspaces in n -dimensional space. Here, the integer d is the greatest common divisor of k and n and the action is via cluster transformations. In joint work with Fraser, we have shown how this action lifts to Jensen–King–Su’s additive categorification of the Grassmannian. We will explain how it fits into the theory of (relative) Calabi–Yau structures and (relative) Calabi–Yau completions due to Ginzburg, . . . , Toën, Brav–Dyckerhoff and Yeung.

Maxim Kontsevich (IHES)

Riemann–Hilbert correspondence for q -difference modules

I will propose a formulation of Riemann–Hilbert correspondence for holonomic q -difference equations in arbitrary many variables, in the case $|q| < 1$. The answer is given in terms of Fukaya categories of rational Lagrangian cones, and coherent sheaves on the power of an elliptic curve. The limiting case $|q| = 1$ also make sense, giving infinitely many algebraic structures on the same analytic stack. If the time permits, I’ll speculate about general Torelli theorem for complex analytic noncommutative spaces (joint work in progress with Y. Soibelman).

Valery Lunts (Indiana University Bloomington)

Algebraicity of vector fields in characteristic zero and characteristic $p > 0$

I will discuss a conjecture of Shepherd-Baron and Ekhedal (unpublished) that a distribution E on a variety over \mathbb{Q} is algebraic (i.e. most leaves are algebraic) if (and only if) for almost all primes p , the reduction E_p is algebraic. This is a joint work in progress with D. Leshchiner

Shinnosuke Okawa (Osaka University)

On semiorthogonal indecomposability of irregular surfaces

Recently a couple of works appeared which discuss semiorthogonal indecomposability of smooth projective varieties of positive irregularity ($= h^{0,1}$). I will briefly recall these results from a unified point of view and discuss the case of surfaces in detail.

Alexander Polishchuk (University of Oregon)

Homological mirror symmetry for chain type polynomials

This is a joint work with Umut Varolgunes. We outline the proof of an equivalence between the Fukaya–Seidel category of a chain type polynomial and the category of graded matrix factorizations of the dual polynomial (modulo some general statements about Fukaya–Seidel categories). The proof is based on a certain recursive construction for these categories.

Alexey Rosly (Skoltech and IITP)

On superconnections old and not very old

I will tell how Alexey can create super problems.

Vyacheslav Shokurov (Johns Hopkins)

Positivity of moduli part of adjunction

Basic properties of moduli part of adjunction will be discussed. Reduction of the b -nef property to the curve base case will illustrate application of those properties.

Michel Van den Bergh (Universiteit Hasselt)

Deformations of triangulated categories with t -structure

We discuss joint work with Francesco Genovese and Wendy Lowen in which we extend the deformation theory of abelian categories, developed jointly with Wendy Lowen, to the context of triangulated categories with t -structure.

Alexander Vishik (University of Nottingham)

On isotropic and numerical equivalence of cycles

Isotropic motivic categories provide local versions of the Voevodsky category of motives. Considered over “flexible fields”, these categories are much handier than the global one and more reminiscent of the topological counterpart. The pure part of them, the category of “isotropic Chow motives” is hypothetically equivalent to the category of “numerical Chow motives” (with finite coefficients). This implies that isotropic realizations should provide a large supply of new points for the tensor-triangulated spectrum $\mathrm{Spc}(\mathrm{DM}^c(\mathbb{k}))$ (in the sense of Balmer) of the Voevodsky category. I will discuss the proof of this Conjecture for a range of new cases.

Ilya Zhdanovskiy (MIPT)

On some questions of linear algebra

I will tell about geometric properties of commutators of projectors. This talk is based on joint work with Anna Kocherova.