

CURRICULUM VITAE

Name: Kuznetsov Alexander

Date of birth: November 1, 1973.

Citizenship: Russia

Current address: Algebraic Geometry Section,
Steklov Mathematical Institute, Russian Academy of Sciences,
Gubkina str. 8, 119991, Moscow, Russia

Telephone Number: (7499) 135-25-49

E-mail: akuznet@mi.ras.ru

Education:

- 1990–1995 student in Moscow State University
- 1995–1998 graduate student in Moscow State University and Independent University of Moscow

Current Position: Leading Researcher at Steklov Mathematical Institute

Positions Held:

- 1997, January–February: visitor, Max-Planck Institut für Mathematik, Bonn
- 1998, February–March: visitor, Max-Planck Institut für Mathematik, Bonn

- 1999, January–March: visitor, Institut des Hautes Études Scientifiques, Paris
- September 1999 – April 2000: member of Institute for Advanced Study, Princeton
- 2001, January–February: visitor, University of Chicago
- 2002, January: visitor, Université Paul Sabatier, Toulouse
- 2002, February: visitor, Institut de Mathématiques de Luminy, Marseille
- 2006, June: visitor, Institut de Mathématiques de Luminy, Marseille
- 2007, June: visitor, SISSA, Trieste
- 2008, June: visitor, University of Barcelona
- 2010, June–July: visitor, SISSA, Trieste
- 2012, January: visitor, Bloomington, Indiana University
- 2012, August: visitor, SISSA, Trieste
- 2013, August: visitor, SISSA, Trieste
- 2014, January: visitor, ENS, Paris
- 2014, July–August: visitor, SISSA, Trieste
- 2015, January: visitor, Imperial College, London
- 2015, June–July: visitor, SISSA, Trieste
- 2016, January: visitor, ENS, Paris

Talks at conferences:

- *Derived categories of cubic and V_{14} threefolds*, “Geometry of moduli spaces”, Lille, June 10–14, 2003.
- *Derived categories of plane sections of some Fano manifolds*, “Noncommutative Algebra and Algebraic Geometry”, Mathematics Institute, University of Warwick, June 14–18, 2004.
- *Homological Projective Duality and Triangulated Categories of Singularities*, “Coherent Sheaves and Mirror Symmetry”, University of Cambridge, May 19–22, 2005.

- *Homological Projective Duality and Triangulated Categories of Singularities*, “Birational Geometry, Derived Categories and Singularities”, Steklov Math Institute, Moscow, June 14–18, 2005.
- *Derived categories and hyperplane sections*, “Classification Problems and Mirror Duality”, Steklov Math Institute, Moscow, February 27 – March 3, 2006.
- *Derived categories of Fano 3-folds*, “Workshop on Derived Categories of Coherent Sheaves”, Korea Institute for Advanced Study, Seoul, May 1–4, 2006.
- *Homological Projective Duality*, “Satellite Conference on Algebraic Geometry”, Segovia, Spain, August 16–19, 2006.
- *Homological Projective Duality*, “Homological Mirror Symmetry and Applications I”, Institute for Advanced Study, Princeton, January 22–26, 2007.
- *Derived categories of quadric fibrations and intersections of quadrics*, “Workshop on Algebraic Geometry and Physics 2007”, Korea Institute for Advanced Study, Seoul, June 25 – June 29, 2007.
- *Symplectic structures on moduli spaces of sheaves via the Atiyah class*, “Modular Forms and Moduli Spaces”, Saint-Petersburg, Russia, July 2–7, 2007.
- *Categorical resolutions of singularities*, “Program on Algebraic, Symplectic Geometry and Physics”, EPFL, Lausanne, Switzerland, August 20 – September 7, 2007.
- *Categorical resolutions of singularities*, “Categorical Aspects of Algebraic Geometry in Mirror Symmetry”, Research Institute for Mathematical Sciences, Kyoto, December 3–7, 2007.
- *Derived categories of Fano 3-folds*, “Workshop on Homological Mirror Symmetry and Related Topics”, University of Miami, January 21–26, 2008.
- *Derived categories of Fano 3-folds*, “Bundles, gerbes and derived categories in string theory”, University of Salamanca, May 14–16, 2008.

- *Derived categories and rationality of cubic fourfolds*, 5-th European Congress of Mathematics, Amsterdam, July 14-18, 2008.
- *Derived categories of Fano 3-folds*, 60 Miles — a meeting to celebrate Miles Reid’s sixtieth birthday, London, July 16-18, 2008.
- *Exceptional collections on $SGr(2, 2n)$ and $OGr(2, 2n + 1)$* , “Exceptional collections and degenerations of varieties”, Tokyo, September 1–5, 2008.
- *Fractional Calabi–Yau triangulated categories*, “Workshop on Homological Mirror Symmetry and Related Topics”, Miami, January 19–24, 2009.
- *Calabi–Yau categories*, “Classification of Algebraic Varieties”, Schiermonnikoog, May 10-15, 2009.
- *Derived categories of coherent sheaves and rationality of algebraic varieties*, “Contemporary Mathematics”, Moscow–St.-Petersburg, June 08-12, 2009.
- *Derived categories of Fano 3-folds*, “Geometry of Algebraic Varieties”, Moscow, June 29-July 3, 2009.
- *Hochschild homology and cohomology of admissible subcategories*, “Workshop on Homological Mirror Symmetry and Related Topics”, Miami, January 18–23, 2010.
- *Exceptional collections on isotropic Grassmannians*, “Algebraic Geometry: Methods, Relations, and Applications”, Moscow, February 24–26, 2010.
- *Derived categories and birational invariants*, “Geometry at Large”, Vienna, May 3–7, 2010.
- *Hochschild homology and cohomology of admissible subcategories*, “Perspectives on Algebraic Varieties”, Levico Terme (Trento), September 6–11, 2010.
- *Derived categories of Enriques surfaces and quartic double solids*, “Birational Geometry”, Edinburgh, December 6–10, 2010.
- *Exceptional collections on homogeneous varieties*, “Derived Categories 2011 Tokyo”, Tokyo, January 24–28, 2011.

- *Instanton bundles on Fano threefolds*, “Instantons in complex geometry”, Moscow, March 14–18, 2011.
- *Exceptional collections on Grassmannians of classical groups*, “Derived Categories”, Cambridge, April 11–15, 2011.
- *Enriques surfaces and Artin-Mumford quartic double solids*, “Homological Mirror Symmetry and Category Theory”, Split, Croatia, 11–15, 2011.
- *Enriques surfaces and Artin-Mumford quartic double solids*, “Automorphic forms and Moduli spaces”, CIRM, Luminy, October 10–14, 2011.
- *Categorical resolutions of singularities*, “Workshop on Homological Mirror Symmetry and Related Topics”, Miami, January 23–27, 2012.
- *Categorical resolutions of singularities*, “Algorithmic and Experimental Methods in Algebra, Geometry and Number Theory”, Hanover, February 27–March 1, 2012.
- *Categorical resolutions of singularities*, “Noncommutative Algebraic Geometry and its Applications to Physics”, Leiden, March 19–23, 2012.
- *Categorical resolutions of singularities*, “Birational And Affine Geometry”, Moscow, April 23–27, 2012.
- *Homological Projective Duality*, “Relation of String Theory to Gauge Theories and Moduli Problems of Branes”, Moscow, September 10–14, 2012.
- **minicourse** *Homological Projective Duality*, “Homological Projective Duality and Noncommutative Geometry”, Warwick, October 8–13, 2012.
- *Heights of exceptional collections and Hochschild cohomology of quasiphantoms*, “Algebraic and Differential Geometry of Andrei Tyurin”, Moscow, October 24–26, 2012.
- *Homological Projective Duality I,II*, “Homological Projective Duality and Quantum Gauge Theory”, Tokyo, IPMU, November 12–16, 2012.

- *Categorical resolutions of singularities*, “Higher Dimensional Algebraic Geometry”, Tokyo, January 7–11, 2013.
- **minicourse** *Derived categories of coherent sheaves in birational geometry*, “Géométrie Algébrique et Géométrie Complexe”, Luminy, January 28–February 1, 2013.
- *On a noncommutative blowup*, “Birational Geometry and Geometric Invariant Theory”, Vienna, May 21–24, 2013.
- **minicourse** *Derived Categories of Coherent Sheaves*, “Géométrie Algébrique en Liberté”, Stockholm, June 24–28, 2013.
- **minicourse** *Derived Categories of Coherent Sheaves and Moduli Spaces*, “Geoquant 2013”, Vienna, August 19–30, 2013.
- *Higher blowups*, “Geometry of Algebraic Varieties” dedicated to the memory of V. A. Iskovskikh, Moscow, October 22–25, 2013.
- *Higher blowups*, “Conference on Homological Mirror Symmetry”, Miami, January 27–February 1, 2014.
- *Moduli spaces of sheaves on pfaffian cubic fourfolds via derived categories*, “Moduli spaces of irreducible symplectic varieties, cubics and Enriques surfaces”, Lille, March 24–28, 2014.
- *Calabi–Yau subcategories and Fano manifolds of degree 10*, “A workshop on the Chow group of holomorphically symplectic manifolds”, Moscow, May 19–23, 2014.
- *On K3 fourfolds of K3 type*, “Landau–Ginzburg Theory and Fano Varieties”, Gyeongju, May 26–30, 2014.
- **minicourse** *Derived categories of cubic 4-folds*, Summer school “Derived categories”, Nantes, June 23–27, 2014.
- *Semiorthogonal decompositions in algebraic geometry*, International Congress of Mathematicians 2014, Seoul, August 13–21, 2014.
- **minicourse** *Semiorthogonal decomposition of derived categories*, “Introductory School on Derived Categories”, Warwick, September 8–12, 2014.
- *Refined blowups*, “DG-enhancements and higher category methods”, Warwick, December 8–12, 2014.

- *On some K3 surfaces*, “Algebraic Geometry”, MFO, Oberwolfach, Germany, March 16–20, 2015.
- **minocourse** *Derived categories and birational geometry* and talk *Derived categories of Gushel–Mukai varieties and duality*, “New Techniques in Birational Geometry”, Stony Brook University, Stony Brook, USA, April 7–11, 2015.
- **lecture course** *Derived categories view on rationality problems*, “Rationality Problems in Algebraic Geometry”, CIME, Levico Terme, Italy, June 22–27, 2015.
- *Noncommutative K3 surfaces*, “Interactions between Geometry and Physics”, SISSA, Guarujá, Brazil, August 17–21, 2015.
- *Birational isomorphisms of Gushel–Mukai varieties*, “Projective Algebraic Geometry”, HSE, Moscow, September 7–12, 2015.
- *On categorical joins*, “Categorical and Analytic Invariants in Algebraic Geometry — I”, Steklov Math Institute, Moscow, September 14–18.
- *Geometry and moduli spaces of Gushel–Mukai varieties*, “Moduli spaces in Geometry”, CIRM, Luminy, November 26–30, 2015.
- *Categorical joins — II*, “Categorical and Analytic Invariants in Algebraic Geometry — II”, IPMU, Kashiwa, November 16–20, 2015.

Ph.D. Thesis: 1998, “Vector bundles on Fano threefolds, instantons and birational transforms” under supervision of Alexei Bondal.

Habilitation: 2008, “Homological Projective Duality”.

Research interests: Algebraic geometry, Noncommutative algebraic geometry, Derived categories of coherent sheaves, Mirror Symmetry, Fano varieties.

Lectures read:

- 1997-1998, IUM, Hilbert schemes of points on surfaces (after H. Nakajima);

- 1998-1999, IUM, Discriminants, Resultants and Multidimensional Determinants (after I. Gelfand, M. Kapranov, and A. Zelevinsky)
- 2000-2001, IUM, Vector bundles on complex projective spaces (after C. Okonek, M. Schneider, and H. Spindler)
- 2002-2003, IUM, Algebra.
- 2004, IUM, Algebraic Topology.
- 2006-2007, IUM, Vector bundles on complex projective spaces (after C. Okonek, M. Schneider, and H. Spindler)
- 2008, IUM–Steklov Institute, Homological algebra.
- 2010, IUM–Steklov Institute, Algebraic geometry.
- 2012, IUM–Steklov Institute, Derived categories of coherent sheaves.
- 2013, IUM–Steklov Institute, DG-categories.
- 2015, IUM–Steklov Institute, Vector bundles on complex projective spaces.

Awards:

- Moebius fellowship, 1997
- EMS Prize, 2008

Family status: I am married, with four children.

Publications: I wrote 47 papers, 21 of them in collaboration (see the attached list).

List of publications

- [1] *Increasing trees and alternating permutations*,
Uspehi Matem. Nauk, 1994, V. 49, no. 6, p. 79–110
(in Russian, joint work with I. Pak and A. Postnikov)

- [2] *Trees associated with Motzkin numbers*,
J. Combin. Theory Ser. A, 1996, V. 76, no. 1, p. 145–147
(joint work with I. Pak and A. Postnikov)
- [3] *An exceptional collection of vector bundles on V_{22} Fano threefolds*,
Vestnik MGU, Ser. 1, Mat. Mekh.
1996, no. 3, p. 41–44 (in Russian).
- [4] *The Laumon’s resolution of Drinfeld’s compactification is small*,
Mathematical Research Letters, 1997, V. 4, p. 349–364.
- [5] *Global intersection cohomology of quasimaps’ spaces*,
International Mathematical Research Notices, 1997, No. 7,
p. 301–328
(joint work with M. Finkelberg)
- [6] *GL_4 -equivariant desingularization of the universal curve over the
Ellingsrud-Piene-Stromme compactification of the space of
twisted rational cubic curves in P^3* ,
preprint MPIM/97-21.
- [7] *The length 2 monad for instantons over \mathbb{P}^3 with $c_2 = 3$* ,
preprint MPIM/97-22.
- [8] *Fano threefolds V_{22}* ,
preprint MPIM/97-24.
- [9] *The singular supports of IC sheaves on quasimaps’ spaces are
irreducible*,
American Mathematical Society Translations, Series 2, 1998,
V. 185, p. 85–93
(joint work with M. Finkelberg and I. Mirkovic)
- [10] *Semi-Infinite flags II. Local and global intersection cohomology of
quasimaps’ spaces*,
Differential topology, infinite-dimensional Lie algebras, and
applications, p. 113–148, Amer. Math. Soc. Transl. Ser. 2, 194,
Amer. Math. Soc., Providence, RI, 1999
(joint work with B. Feigin, M. Finkelberg and I. Mirković)
- [11] *A note on a symplectic structure on the space of G -monopoles*,
Communications in Mathematical Physics, 1999, No. 201,
p. 411–421

(joint work with M. Finkelberg, N. Markarian and I. Mirkovic)

- [12] *Parabolic sheaves on surfaces and affine Lie algebra $\widehat{\mathfrak{gl}}_n$* ,
J. reine angew. Math., 2000, V. 529, p. 155–203
(joint work with M. Finkelberg)
- [13] *Noncommutative instantons and twistor transform*,
Communications in Mathematical Physics, 2001, No. 220,
p. 385–432
(joint work with A. Kapustin and D. Orlov)
- [14] *Quiver varieties and Hilbert schemes*,
Moscow Mathematical Journal, Volume 7 (2007), Number 4.
- [15] *Quiver varieties and a noncommutative \mathbb{P}^2* ,
Compositio Mathematica, 2002, V. 134, p. 283–318
(joint work with V. Baranovsky and V. Ginzburg)
- [16] *Uhlenbeck spaces for \mathbb{A}^2 and affine Lie algebra $\widehat{\mathfrak{sl}}_n$*
Publ. Res. Inst. Math. Sci., V. 39 (2003), No. 4, p. 721–766
(joint work with M. Finkelberg and D. Gaietsgory)
- [17] *Wilson’s grassmanian and a noncommutative quadric*,
International Mathematical Research Notices, 2003, No. 21,
p. 1155–1197
(joint work with V. Baranovsky and V. Ginzburg)
- [18] *Derived categories of cubic and V_{14} threefolds*,
Proc. V.A.Steklov Inst. Math, V. 246 (2004), p. 183–207;
preprint math.AG/0303037.
- [19] *Derived categories of Fano threefolds V_{12}* ,
Mat. zametki, V. 78, n. 4 (2005), p. 579–594,
translation in Mathematical Notes, V. 78, n. 4 (2005), p. 537–550.
- [20] *Hyperplane sections and derived categories*,
Izvestiya RAN: Ser. Mat. 70:3 (2006) p. 23–128 (in Russian);
translation in Izvestiya: Mathematics 70:3 (2006) p. 447–547.
- [21] *Homological projective duality*,
Publications Mathematiques de L’IHES, 105, n. 1 (2007),
157-220.
- [22] *Derived categories of quadric fibrations and intersections of quadrics*,

Advances in Mathematics, V. 218 (2008), N. 5, 1340-1369.

- [23] *Exceptional collections for Grassmannians of isotropic lines*, Proceedings of the London Mathematical Society, V. 97 (2008), N. 1, 155-182.
- [24] *Lefschetz decompositions and categorical resolutions of singularities*, Selecta Mathematica, V. 13 (2008), N. 4, 661-696.
- [25] *Homological projective duality for Grassmannians of lines*, preprint math.AG/0610957.
- [26] *Symplectic structures on moduli spaces of sheaves via the Atiyah class*, Journal of Geometry and Physics, V. 59 (2009) N. 7, 843–860 (joint work with D. Markushevich).
- [27] *Base change for semiorthogonal decompositions*, Compositio Mathematica, V. 147 (2011) N. 3, 852–876.
- [28] *Abel-Jacobi maps for hypersurfaces and non commutative Calabi-Yau's*, Communications in Contemporary Mathematics Vol. 12, No. 3 (2010) 373–416 (joint work with L. Manivel and D. Markushevich).
- [29] *Derived categories of cubic fourfolds*, in “Cohomological and Geometric Approaches to Rationality Problems. New Perspectives” Series: Progress in Mathematics, Vol. 282, Bogomolov, Fedor; Tschinkel, Yuri (Eds.) 2010, X, 314 p. 47 illus., Hardcover ISBN: 978-0-8176-4933-3 A Birkhäuser book, preprint math.AG/0808.3351,
- [30] *Derived categories of Fano threefolds*, Proc. V.A.Steklov Inst. Math, V. 264 (2009), p. 110–122; preprint math.AG/0809.0225 .
- [31] *Hochschild homology and semiorthogonal decompositions*, preprint math.AG/0904.4330.
- [32] *Scheme of lines on a family of 2-dimensional quadrics: geometry and derived category*, Mathematische Zeitschrift, V. 276, Issue 3 (2014), 655–672.

- [33] *On nodal Enriques surfaces and quartic double solids*,
Mathematische Annalen, Volume 361, Issue 1–2 (2015), 107–133
(joint work with C. Ingalls).
- [34] *Exceptional collection on isotropic Grassmannians*,
to appear in JEMS, preprint math.AG/1110.5607
(joint work with A. Polishchuk).
- [35] *Instanton bundles on Fano threefolds*,
CEJM 2012, 10(4), 1198–1231;
preprint math.AG/1203.3975.
- [36] *Height of exceptional collections and Hochschild cohomology of quasiphantom categories*, J. Reine Angew. Math. 708, 213–243 (2015).
- [37] *Categorical resolutions of irrational singularities*,
International Mathematical Research Notices 2015, No. 13,
p. 4536–4625 (joint work with V. Lunts)
- [38] *A simple counterexample to the Jordan–Hölder property for derived categories*,
preprint math.AG/1304.0903.
- [39] *Semiorthogonal decompositions in algebraic geometry*,
Proceedings of ICM-2014, preprint math.AG/1404.3143.
- [40] *Refined blowups*,
to appear in Math. Res. Letters, preprint math.AG/1410.7121
(joint work with D. Kaledin).
- [41] *Derived categories of cyclic covers and their branch divisors*,
to appear in Selecta Math., preprint math.AG/1411.1799
(joint work with A. Perry).
- [42] *On K uchle manifolds with Picard number greater than 1*,
Izvestiya RAN: Ser. Mat. 79:4 (2015) p. 57–70 (in Russian);
translation in Izvestiya: Mathematics 79:4 (2015) p. 698–709.
- [43] *Towards a cluster structure on trigonometric zastava*, preprint
math.AG/1504.05605 (joint work with M. Finkelberg,
L. Rybnikov, and G. Dobrovolska).

- [44] *Intersection cohomology of the Uhlenbeck compactification of the Calogero–Moser space*, preprint math.AG/1506.05205 (joint work with M. Finkelberg, V. Ginzburg, and A. Ionov).
- [45] *Calabi–Yau and fractional Calabi–Yau categories*, preprint math.AG/1509.07657.
- [46] *Derived categories view on rationality problems*, preprint math.AG/1509.09115.
- [47] *Gushel–Mukai varieties: classification and birationalities*, preprint math.AG/1510.05448 (joint work with O. Debarre).