

## ALEXANDER A. VORONOV

<b>Education:</b>	Ph.D. in Mathematics, Moscow State University Thesis advisor: Y. I. Manin	1988
	B.S. in Mathematics Moscow State University summa cum laude	1985
<b>Employment:</b>	Visiting Senior Scientist, Kavli IPMU, Kashiwa, Japan	2010 – Present
	Professor, University of Minnesota	2007 – Present
	Associate Head, University of Minnesota	2007–11
	Associate Professor, University of Minnesota	2001–07
	Associate Professor, Michigan State University	2000–01
	Assistant Professor, Michigan State University	1998–2000
	Visiting Assistant Professor, M.I.T.	1996–98
	Lecturer, University of Pennsylvania	1993–96
	Lecturer, Princeton University	1991–93
	Visiting Assistant Professor, University of CA, Davis	1990–91
	Junior Researcher, Moscow State University, Russia	1988–90
<b>Short-Term Positions:</b>	Visiting Professor, NYU Abu Dhabi, UAE	Jan–May 2019
	Visitor, CGP, IBS, Postech, Pohang, Korea	May, Dec 2016
	Visiting Professor, University of Tokyo, Japan	Aug–Sep 2015
	Visitor, SCGP, Stony Brook, NY	June 2015
	Visitor, IHES, Bures-sur-Yvette	95, 96, 99, 00, 03, 08, 09, 14
	Visiting Professor, Max-Planck-Institut, Bonn	94, 95, 98, 02, 12
	Member, MSRI, Berkeley, CA	Spring 2006
	Member, Fields Institute, Toronto	Spring 2005
	Invited Lecturer, Fourier Institute, Grenoble	June 1999
<b>Professional Memberships:</b>	Graduate Faculty Mentor, Alliance	2016 – Present
	Member, American Mathematical Society	2015 – Present
<b>Honors and Awards:</b>	Fellow of the AMS, 2019 Class	2018
	Distinguished Visitor, Lancaster University, UK	Spring 2017
	FSMP Lecturer, University of Tokyo	September 2015
	Simons Fellow in Mathematics	2012
	JSPS Fellow for Research in Japan	Summer 2010
	Stone Visiting Professor, Northeastern University	Spring 2004
	Invited Address, <i>AMS Meeting</i> , Buffalo, NY	April 1999
	AMS Centennial Research Fellow	1996
	“Good Teaching Award” (University of Pennsylvania)	Fall 1995
<b>Editorial:</b>	Editor, <i>Higher Structures</i>	2016 – Present
<b>Advisory:</b>	International Scientific Board, Neuron Fund, Prague	2018 – Present
	International Advisory Board, Institute of Mathematics of the Czech Academy of Sciences, Prague	2016-19
	Simons Collaboration Grant Review	2015-17
	NSF Review Panels	2002, 09
<b>Conference Organization:</b>	Organizer (with M. Markl and R. Kaufmann), Special Session on <i>Higher Structures in Geometry, Topology and Physics</i> , AMS Meeting, Purdue	March 2022
	Organizer (with H. Sati), Workshop on <i>Superphysmatics II</i> , NYU Abu Dhabi, UAE	May 2019
	Organizer (with Bumsig Kim), Winter School on	

*Higher Categories and TQFT*, KIAS, Seoul, South Korea December 2016  
 Organizer (with R. Kaufmann), Special Session on  
*Topology and Physics*, AMS Meeting, Minneapolis, MN October 2016  
 Advisory Committee, XXIII, XXIV, XXXIV, and XXXV  
 Workshops on *Geometric Methods in Physics*, Poland 2004, 05, 15  
 Scientific Committee, Workshop on *Algebra,*  
*Geometry, and Mathematical Physics*, Bedlewo, Poland October 2009  
 Advisory Committee, Conference on  
*Supersymmetry and Quantum Field Theory*, Ukraine April 2006  
 Organizer (with T. Lada and J. Stasheff), Special Session  
 on *Homotopical Physics*, AMS Meeting, Lawrenceville, NJ April 2004  
 Advisory Committee, *International Symposium*  
*on Kac-Moody Lie algebras*, University of Madras, India December 2001  
 Organizer, Special Session on *Operads, Algebras, and*  
*Their Applications*, AMS Meeting, Buffalo, NY April 1999  
 Organizer (with J. Stasheff), Special Session on *Moduli*  
*Spaces, Operads and Representation Theory*,  
 AMS Meeting, Hartford, CT March 1995

**Selected  
Talks:**

Colloquium talks at Texas Tech, UC Riverside,  
 Harvard-MIT-Brandeis-Northeastern, Stanford, Yale,  
 Michigan, Wisconsin, Minnesota, Stony Brook, Purdue,  
 Duke, Southern California, Dartmouth, Toronto,  
 Lancaster, NYUAD. . .

*M-Theory and Mathematics*, NYU Abu Dhabi, UAE January 2023  
*Higher Structures in Prague*,  
 Institute of Mathematics of the Czech Academy, Czechia September 2022  
*Topological Methods in Mathematical Physics*,  
 Majorana Centre, Erice, Italy September 2022  
*First International Congress on Topology*  
*and Related Topics*, Lima, Peru October 2021  
*Homotopical Algebra and Higher Structures*,  
 Mathematisches Forschungsinstitut Oberwolfach September 2021  
*Geometry for Higher Spin Gravity: Conformal Structures,*  
*PDEs, and Q-manifolds*, E. Schrödinger Institute, Vienna August 2021  
*Supergeometry, Supersymmetry and Quantization*  
 Luxembourg Dec 2019  
*Mathematics - String Theory Seminar*, IPMU,  
 University of Tokyo, Kashiwa, Japan August 2019  
*Superphymatics II*, NYU Abu Dhabi, UAE May 2019  
*Operad Theory & Related Topics*, Anhui Unvrsty, China November 2018  
*Higher Structures 2*, University of Pennsylvania March 2018  
 AMS Meeting, University at Buffalo, NY September 2017  
*GAP XV Quantization*, Penn State August 2017  
*Topology Seminar*, University of Tokyo April 2017  
 Minicourse, *Higher Categories and TQFT*,  
 Seoul, South Korea December 2016  
 Minicourse, *20th Brazilian Topology Meeting*,  
 Curitiba, Brazil July 2016  
 Center for Geometry and Physics, IBS, Pohang, Korea May 2016  
*Closing Conference on Higher Structures*, MPIM, Bonn Mar 2016  
 AMS Meeting, Loyola University, Chicago Oct 2015  
*Workshop on Braids, Configuration Spaces and Quantum*  
*Topology*, Tokyo, Japan September 2015  
*Workshop Rikkyo MathPhys 2015*,  
 Tokyo, Japan January 2015

<i>Workshop on Homological Methods in Algebra, Geometry &amp; Physics</i> , London, UK	July 2014
Plenary address, <i>XXXIII Workshop on Geometric Methods in Physics</i> , Bialowieza, Poland	June-July 2014
<i>Integrable systems and moduli spaces</i> Banff, Canada	August 25–30, 2013
<i>AMS Meeting</i> , Iowa State University, Ames, IA	April 2013
<i>Mathematical Physics in Bahia</i> Salvador, Brazil	July 5–10, 2012
<i>Midwest Topology Seminar</i> Purdue, West Lafayette	April 28–29, 2012
<i>CBMS Conference on Deformation Theory of Algebras and Modules</i> , NCSU, Raleigh	May 16–20, 2011
<i>Texas Geometry and Topology Conference</i> Texas Tech, Lubbock	February 18–20, 2011
<i>AMS Meeting</i> , University of Notre Dame	November 2010
<i>AMS-KMS Joint Meeting</i> Ewha Women’s University, Seoul, Korea	December 2009
<i>Conference on Quantum algebra related to field theories in geometries</i> , Kyoto, Japan	February 16–20, 2009
Plenary address, <i>Workshop on Algebraic Structures in Geometry and Physics</i> , Leicester, UK	July 21–25, 2008
<i>Journée Groupes Quantiques et Géométrie de Poisson</i> Paris, France	June 3, 2008
<i>Workshop on Symplectic Field Theory</i> Leipzig, Germany	August 5–11, 2006
Plenary address, <i>Workshop on Deformation Quantization and String Topology</i> , Prague, the Czech Republic	May, 2006
Keynote address, <i>The 20th British Topology Meeting</i> , Bristol, UK	September 12–14, 2005
Plenary address, <i>Conference on Groups, Homotopy and Configuration Spaces</i> , Tokyo, Japan	July 5–11, 2005
Lecturer, <i>Summer School on String Topology and Hochschild Homology</i> , University of Almeria, Spain	September 2003
Plenary Speaker, <i>3rd International Symposium on Quantum Theory and Symmetries</i> , Cincinnati	September 2003
Invited address, <i>Algebraic Topology of String Theory and Moduli Space of Riemann Surfaces</i> , Stony Brook	August 2003
Plenary address, <i>XXII Workshop on Geometric Methods in Physics</i> , Bialowieza, Poland	June-July 2003
Lecturer, <i>Graphs and Patterns in Mathematics and Theoretical Physics</i> , Stony Brook	June 2001
Lecturer, <i>School on Operads and Their Applications</i> , Hebrew University of Jerusalem	Feb–Mar 2000
Invited address, <i>AMS Meeting</i> , Buffalo, NY	April 1999
Lecturer, <i>Graduate Colloquium Series</i> , University of Munich	June 1997
<i>AMS-IMS-SIAM Joint Summer Research Conference on Quantization</i> , Mount Holyoke College	July 1996
Plenary address, <i>Conference Higher Homotopy Structures in Topology and Mathematical Physics</i> , Vassar College	June 1996
Plenary address, <i>Workshop on Cyclic Cohomology and Noncommutative Geometry</i> , Waterloo, Canada	June 1995
Plenary address, <i>International Conference on Operads and Homotopy Algebra</i> , Luminy, France	May-June 1995
Invited Speaker, <i>International Conference on The Moduli Space of Curves</i> in Texel, Holland	April 1994

**PhD Students:** E. Harrelson PhD'06, J. Zuniga PhD'07, K. Chung PhD'08,  
A. Hanhart PhD'09, Hao Yu PhD'10, D. Bashkirov PhD'14,  
A. Sharma PhD'16, D. Diroff PhD'19, N. Ott PhD'20,  
K. Maxwell PhD'21, E. Schlossberg (since Summer 2022)

**Postdocs:** B. Badzioch 2001–04, S. O. Wilson 2005–08

## PUBLICATIONS:

### Books and Collections:

1. *String Topology and Cyclic Homology* (with R. L. Cohen and K. Hess), Adv. Courses Math. CRM Barcelona, Birkhäuser, Basel, 2006, 163 pp.
2. *Operads: Proceedings of Renaissance Conferences* (coedited with J.-L. Loday and J. Stasheff), Contemp. Math., vol. 202. AMS, Providence, RI, 1997.

### Popular science notes:

1. *What IPMU stands for. Kavli IPMU News.* **45** (2019), 9.
2.  *$\lambda$ -Adic topology. Kavli IPMU News.* **42** (2018), 22.
3. *What is a WDVV-algebra? Kavli IPMU News.* **42** (2018), 16.
4. *Hey, tell me what you do in research! Kavli IPMU News.* **37** (2017), 14.
5. *In search of solitons in Amsterdam. Kavli IPMU News.* **34** (2016), 13.
6. *Urashima effect: a version. Kavli IPMU News.* **31** (2015), 22–23.

### Papers:

1. *Mysterious Triality and M-Theory* (with H. Sati), Preprint IPMU23-0001, 69 pp., arXiv:2212.13968 [hep-th], submitted.
2. *Mysterious Triality and Rational Homotopy Theory* (with H. Sati), Preprint IPMU21-0084, 46 pp., accepted to Commun. Math. Phys., arXiv:2111.14810 [hep-th].
3. *The supermoduli space of genus zero super Riemann surfaces with Ramond punctures* (with N. Ott), 30 pp., Journal of Geometry and Physics **185** (2023), 104726, arXiv:1910.05655 [math.AG].
4. *On the BV structure on the cohomology of moduli space* (with S. Sakalli), Pure and Applied Mathematics Quarterly **16** (2020), no. 3, 755–773, arXiv:1912.13045 [math.AG].
5. *Quantizing deformation theory II*, Pure and Applied Mathematics Quarterly **16** (2020), no. 1, 125–152, arXiv:1806.11197 [math.QA].
6. *On homotopy Lie bialgebroids* (with D. Bashkirov), Preprint IPMU16-0198, 21 pp., arXiv:1612.02026 [math.QA].
7. *The MV formalism for  $IBL_\infty$ - and  $BV_\infty$ -algebras* (with M. Markl), Lett. Math. Phys. (2017), **107** (2017), no. 8, 1515–1543, arXiv:1511.01591 [math.QA].
8. *Categorification of Dijkgraaf-Witten Theory* (with A. Sharma), Adv. Theor. Math. Phys. **21** (2017), no. 4, 1023–1061, arXiv:1511.00295 [math.AT].
9.  *$r_\infty$ -Matrices, triangular  $L_\infty$ -bialgebras, and quantum $_\infty$  groups* (with D. Bashkirov), Geometric Methods in Physics. XXXIII Workshop 2014, 39–47, Trends in Mathematics, Birkhäuser Boston, Inc., Boston, MA, 2015, arXiv:1412.2413 [math.QA].
10. *The BV formalism for  $L_\infty$ -algebras* (with D. Bashkirov). *J. Homotopy Relat. Struct.* **12** (2017), no. 2, 305–327, arXiv:1410.6432 [math.QA].
11. *A higher category of cobordisms and topological quantum field theory* (with M. Feshbach), Preprint IPMU11-0143, 37 pp., arXiv:1108.3349 [math.QA].
12. *Open-closed moduli spaces and related algebraic structures* (with E. Harrelson and J. J. Zuniga). Lett. Math. Phys. **94** (2010), no. 1, 1–26, arXiv:0709.3874 [math.QA].
13. *Graph homology: Koszul and Verdier duality* (with A. Lazarev), Adv. Math. **218** (2008), no. 6, 1878–1894, math.QA/0702313.

14. *Notes on string topology* (with R. L. Cohen), *String topology and cyclic homology*, 1–95, Adv. Courses Math. CRM Barcelona, Birkäuser, Basel, 2006, [math.GT/0503625](#).
15. *The canonical delooping machine* (with B. Badzioch and K. Chung). *J. of Pure and Applied Algebra* **208** (2007), no. 2, 531–540, [math.AT/0403098](#).
16. *On Kontsevich’s Hochschild cohomology conjecture* (with P. Hu and I. Kriz). *Compos. Math.* **142** (2006), no. 1, 143–168, [math.AT/0309369](#).
17. *PROPPed up graph cohomology* (with M. Markl). *Algebra, arithmetic, and geometry: in honor of Yu. I. Manin. Vol. II*, 249–281, *Progr. Math.*, **270**, Birkhäuser Boston, Inc., Boston, MA, 2009, [math.QA/0307081](#).
18. *Notes on universal algebra*. *Graphs and Patterns in Mathematics and Theoretical Physics* (M. Lyubich and L. Takhtajan, eds.), *Proc. Sympos. Pure Math.*, vol. 73. AMS, Providence, RI, 2005, pp. 81–103, [math.QA/0111009](#).
19. *Homotopy Gerstenhaber algebras*, *Conférence Moshé Flato 1999* (G. Dito and D. Sternheimer, eds.), vol. 2. Kluwer Academic Publishers, the Netherlands, 2000, pp. 307–331, [math.QA/9908040](#).
20. *The Swiss-cheese operad*, *Homotopy invariant algebraic structures* (Baltimore, MD, 1998), *Contemp. Math.*, vol. 239. AMS, Providence, RI, 1999, pp. 365–373, [math.QA/9807037](#).
21. *Cohomology of conformal algebras* (with B. Bakalov and V. G. Kac), *Comm. Math. Phys.* **200** (1999), 561–598, [math.QA/9803022](#).
22. *Stability of the rational homotopy type of moduli spaces*, *Higher homotopy structures in topology and mathematical physics* (Poughkeepsie, NY, 1996), *Contemp. Math.*, vol. 227. AMS, Providence, RI, 1999, pp. 315–321, [alg-geom/9708019](#).
23. *Semi-Infinite Induction and Wakimoto Modules*, *Amer. J. Math.* **121** (1999), no. 5, 1079–1094, [q-alg/9704020](#).
24. *Quantizing Poisson manifolds*. *Perspectives on Quantization* (L. A. Coburn and M. A. Rieffel, eds.), *Contemp. Math.*, vol. 214. AMS, Providence, RI, 1998, pp. 189–195, [q-alg/9701017](#).
25. *Homotopy Gerstenhaber algebras and topological field theory* (with T. Kimura and G. Zuckerman). *Operads: Proceedings of Renaissance Conferences* (J.-L. Loday, J. Stasheff, and A. A. Voronov, eds.), *Contemp. Math.*, vol. 202. AMS, Providence, RI, 1997, pp. 305–334.
26. *Semiquantum geometry* (with N. Reshetikhin and A. Weinstein). *Algebraic geometry*, 5. *J. Math. Sci.* **82** (1996), no. 1, 3255–3267.
27. *Homology of moduli spaces of curves and commutative homotopy algebras* (with T. Kimura and J. Stasheff). *The Gelfand Mathematical Seminars, 1993–1995*. Edited by I. Gelfand, J. Lepowsky, and M. M. Smirnov. Birkhäuser Boston, Inc., Boston, MA, 1996, pp. 151–170.
28. *Cohomology and deformation of Leibniz pairs* (with M. Flato and M. Gerstenhaber). *Letters in Mathematical Physics* **34**(1), 77–90 (1995).
29. *The cohomology of algebras over moduli spaces* (with T. Kimura). In: *The Moduli Space of Curves* (R. Dijkgraaf, C. Faber, and G. van der Geer, eds.) *Progress in Mathematics*, vol. 129. Birkhäuser, Boston, MA, 1995, pp. 305–334.
30. *Homotopy G-algebras and moduli space operad* (with M. Gerstenhaber). *Internat. Math. Research Notices* 141–153 (1995).
31. *Higher-order operations on Hochschild complex* (with M. Gerstenhaber). *Functional Anal. Appl.* **29**(1), 1–6 (1995).

32. *On operad structures of moduli spaces and string theory* (with T. Kimura and J. Stasheff). *Comm. Math. Phys.* **171**, 1–25 (1995).
33. *Topological field theories, string backgrounds and homotopy algebras*. In: Proceedings of the XXII<sup>nd</sup> International Conference on Differential Geometric Methods in Theoretical Physics, Ixtapa-Zihuatanejo, México (J. Keller and Z. Oziewicz, eds.) *Advances in Applied Clifford Algebras (Proc. Suppl.)* **4** (S1) 167–178 (1994).
34. *Semi-infinite cohomology of Lie algebras*. *Proc. Sympos. Pure Math.* **56**, part 2, 401–415 (1994).
35. *Semi-infinite homological algebra*. *Invent. Math.* **113**, 103–146 (1993).
36. *BRST cohomology: a new derived functor*. In: XX<sup>th</sup> International Conference on Differential Geometric Methods in Theoretical Physics, vol. 2. World Scientific, Singapore, 1992, pp. 905–912.
37. *Complex divisors on algebraic curves and some applications to string theory*. *Contemp. Math.* **131**, part 3, 515–522 (1992).
38. *A unified approach to string scattering amplitudes*. *Comm. Math. Phys.* **131**, 179–218 (1990). *Erratum:* **140**, 415–416 (1991).
39. *Superconformal geometry and string theory* (with A. A. Rosly and A. S. Schwarz). *Comm. Math. Phys.* **120**(3), 437–450 (1989).
40. *Geometry of superconformal manifolds* (with A. A. Rosly and A. S. Schwarz). *Comm. Math. Phys.* **119**, 129–152 (1988).
41. *Supercellular partitions of flag superspaces* (with Yu. I. Manin). *Current problems in mathematics. Newest results, USSR Acad. Sci., Moscow.* **32**, 27–70 (1988). (in Russian). English translation: *J. Soviet Math.* **51**(1), 2083–2108 (1990).
42. *Elements of supergeometry* (with Yu. I. Manin and I. B. Penkov). *Current problems in mathematics. Newest results, USSR Acad. Sci., Moscow.* **32**, 3–26 (1988) (in Russian). English translation: *J. Soviet Math.* **51**(1), 2069–2082 (1990).
43. *A formula for the Mumford measure in superstring theory*. *Functional Anal. Appl.* **22**(2), 139–140 (1988).
44. *The relative disposition of Schubert supervarieties and the resolution of their singularities*. *Functional Anal. Appl.* **21**, 62–64 (1987).
45. *Schubert supercells* (with Yu. I. Manin). *Functional Anal. Appl.* **18**, 329–330 (1985).
46. *Mappings of supermanifolds*. *Theoret. and Math. Phys.* **60**, 660–664 (1985).