

# Peter Koroteev

Department of Mathematics  
University of California, Berkeley  
970 Evans Hall  
Berkeley, CA 94720-3840  
United States of America

Email: [pkoroteev@berkeley.edu](mailto:pkoroteev@berkeley.edu)    <https://math.berkeley.edu/~pkoroteev/>

## Employment History

2023-current    *Visiting Assistant Professor*, University at Buffalo, Department of Mathematics  
2019-current    *Lecturer*, University of California, Berkeley, Department of Mathematics  
2016-2019        *Krener Assistant Professor*, University of California, Davis, Department of Mathematics  
2012-2016        *Postdoctoral Fellow*, Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada.

## Research Interests

Algebraic Geometry, Representation Theory, Integrable Systems, Mathematical Physics

## Appointments held

2017              *Visitor*, IHES, Bures-sue-Yvette, France  
2014, 2017        *Visitor*, Kavli Institute for Theoretical Physics, Santa Barbara  
2012              *Graduate Fellow*, Kavli Institute for Theoretical Physics, Santa Barbara  
2008-2012        *Graduate Student*, University of Minnesota, Minneapolis  
2007-2009        *Visiting Researcher*, Albert Einstein Institute, Max Planck Institute, Golm, Germany

## Education

2012              PhD: University of Minnesota

## Grants, honors & awards

2020              AMS-Simons travel grant  
2012              KITP Graduate Fellowship (NSF)  
2011              Anatoly Larkin Fellowship in Physics at University of Minnesota  
2009-2010        GAPSA travel grants by University of Minnesota  
2007-2008        N.N. Bogolyubov stipend for senior students by INR RAS, Moscow  
2007-2008        Dynasty Foundation prize for senior undergraduate students  
2006-2007        Research student fellowship by ITEP, Moscow

## Teaching

University of California Berkeley

Math-1A *Calculus*. 2023

Math-55 *Discrete Mathematics*. 2022

Math-54 *Linear Algebra*. 2021, 2023

Math-53 *Multivariable Calculus*. 2020

Math-142 *Elementary Algebraic Topology*. 2019

Math-H185 *Honors Introduction to Complex Analysis*. 2019

Math-185 *Introduction to Complex Analysis*. 2019

University of California Davis

MAT-125A *Real Analysis*. Spring quarter 2016

MAT-108 *Introduction to Abstract Math*. Winter quarter 2016

MAT-016A *Short Calculus*. Spring quarter 2017

MAT-25 *Advanced Calculus*. Winter quarter 2018

MAT-16B *Calculus*. Spring quarter 2018

MAT-21B *Calculus*. Fall quarter 2018

## Workshop Organization

- 2022 Program ‘Geometric and Representation-Theoretic Aspects of Quantum Integrability’ (August 29th - October 21st 2022) [\[link\]](#) with focus workshop ‘Geometric Representation Theory, Integrability, and Supersymmetric Gauge Theories’ [\[link\]](#) at Simons Center of Geometry and Physics at Stony Brook University.
- 2021 Zoom workshop on Elliptic Integrable Systems [\[link\]](#).
- 2021 Zoom workshop on Elliptic Integrable Systems [\[link\]](#).

## Publications

### 41. **The Zoo of Opers and Dualities**

P. Koroteev and A. M. Zeitlin,

arXiv:2208.08031 [math.AG].

*Int. Math. Res. Not.*, in press

### 40. **3d Mirror Symmetry for Instanton Moduli Spaces**

P. Koroteev and A. M. Zeitlin,

arXiv:2105.00588 [math.AG].

*Commun. Math. Phys.* **403**, (2023) 1005–1068

### 39. **q-Opers, QQ-systems, and Bethe Ansatz II: Generalized Minors**

P. Koroteev and A. M. Zeitlin,

arXiv:2108.04184 [math.AG].

*J.Reine Angew. Math.* (2023) 271

38. **Branes and DAHA Representations**  
S. Gukov, P. Koroteev, S. Nawata, D. Pei, and I. Saberi.  
arXiv:2206.03565 [hep-th].  
*SpringerBriefs in Mathematical Physics. Monograph*, **48** (2023)
37. **Toroidal  $q$ -Opers,**  
P. Koroteev and A. M. Zeitlin,  
arXiv:2007.11786 [math.AG].  
*J. Inst. Math. Jussieu* (2021) 1-62
36. **Quantum K-theory of Quiver Varieties and Many-Body Systems**  
P. Koroteev, P. P. Pushkar, A. Smirnov and A. M. Zeitlin.  
arXiv:1705.10419 [math.AG]  
*Selecta Math. New Ser.* 27, 87 (2021).
35.  **$q$ -Opers, QQ-Systems, and Bethe Ansatz,**  
E. Frenkel, P. Koroteev, D. S. Sage and A. M. Zeitlin,  
arXiv:2002.07344 [math.AG].  
*J. Europ. Math. Soc.* (2023)
34.  **$(SL(N), q)$ -opers, the  $q$ -Langlands correspondence, and quantum/classical duality**  
P. Koroteev, D. S. Sage and A. M. Zeitlin.  
arXiv: 1811.09937 [math.RT]  
*Commun. in Math. Phys.* **381** (2021) 641.
33. **A-type Quiver Varieties and ADHM Moduli Spaces**  
P. Koroteev.  
arXiv:1805.00986 [math.AG]  
*Comm. in Math. Phys.* **381** (2021) 175.
32. **Double Inozemtsev Limits of the Quantum DELL System,**  
A. Gorsky, O. Koroteeva, P. Koroteev and S. Shakirov,  
arXiv: 2110.02157 [hep-th]  
*Phys.Lett.B* 826 (2022) 136919
31. **On Dimensional Transmutation in 1+1D Quantum Hydrodynamics,**  
A. Gorsky, O. Koroteeva, P. Koroteev and A. Vainshtein,  
arXiv: 1910.02606 [hep-th]  
*J.Math.Phys.* **61** (2020) 082302
30. **On Quiver  $W$ -algebras and Defects from Gauge Origami**  
P. Koroteev.  
arXiv:1908.04394 [hep-th].  
*Phys. Lett. B* **800**, 135101 (2020)
29. **The Quantum DELL System,**  
P. Koroteev and S. Shakirov,

- arXiv: [1906.10354](https://arxiv.org/abs/1906.10354) [hep-th].  
*Lett.Math.Phys.* **110** (2020) 969-999
28. **qKZ/tRS Duality via Quantum K-Theoretic Counts**  
P. Koroteev and A. M. Zeitlin.  
arXiv: [1802.04463](https://arxiv.org/abs/1802.04463) [math.AG]  
*Math. Res. Lett.* **28** (2021) 435.
27. **On Elliptic Algebras and Large-n Supersymmetric Gauge Theories**  
P. Koroteev and A. Sciarappa.  
arXiv: [1601.08238](https://arxiv.org/abs/1601.08238) [hep-th]  
*J. Math. Phys.* **57**, no. 11, 112302 (2016)
26. **Quantum Hydrodynamics from Large-n Supersymmetric Gauge Theories**  
P. Koroteev and A. Sciarappa.  
arXiv: [1510.00972](https://arxiv.org/abs/1510.00972) [hep-th]  
*Lett. Math. Phys.* **108**, no. 1, 45 (2018)
25. **Defects and Quantum Seiberg-Witten Geometry**  
M. Bullimore, H. C. Kim and P. Koroteev.  
arXiv: [1412.6081](https://arxiv.org/abs/1412.6081) [hep-th]  
*JHEP* **1505**, 095 (2015)
24. **Resurgence and Holomorphy: From Weak to Strong Coupling**  
A. Cherman, P. Koroteev and M. Ünsal.  
arXiv: [1410.0388](https://arxiv.org/abs/1410.0388) [hep-th]  
*J. Math. Phys.* **56**, no. 5, 053505 (2015)
23. **On Three Dimensional Quiver Gauge Theories and Integrability**  
D. Gaiotto and P. Koroteev.  
arXiv: [1304.0779](https://arxiv.org/abs/1304.0779) [hep-th]  
*JHEP* **1305**, 126 (2013)
22. **Good IR Duals of Bad Quiver Theories**  
A. Dey and P. Koroteev.  
arXiv: [1712.06068](https://arxiv.org/abs/1712.06068) [hep-th]  
*JHEP* **1805**, 114 (2018)
21. **On Three-Dimensional Quiver Gauge Theories of Type B**  
A. Dey, A. Hanany, P. Koroteev and N. Mekareeya.  
arXiv: [1612.00810](https://arxiv.org/abs/1612.00810) [hep-th]  
*JHEP* **1709**, 067 (2017)
20. **Non-Abelian Vortex in Four Dimensions as a Critical String on a Conifold**  
P. Koroteev, M. Shifman and A. Yung.  
arXiv: [1605.08433](https://arxiv.org/abs/1605.08433) [hep-th]  
*Phys. Rev. D* **94**, no. 6, 065002 (2016)

19. **Studying Critical String Emerging from Non-Abelian Vortex in Four Dimensions**  
P. Koroteev, M. Shifman and A. Yung.  
arXiv:[1605.01472](#) [hep-th]  
*Phys. Lett. B* **759**, 154 (2016)
18. **Mirror Symmetry in Three Dimensions via Gauged Linear Quivers**  
A. Dey, A. Hanany, P. Koroteev and N. Mekareeya.  
arXiv:[1402.0016](#) [hep-th]  
*JHEP* **1406**, 059 (2014)
17. **Three Dimensional Mirror Symmetry and Integrability**  
P. Koroteev.  
DOI:[10.1090/pspum/088/01468](#)  
*Proc. Symp. Pure Math.* **88**, 317 (2014).
16. **On the Integrability of Four Dimensional N=2 Gauge Theories in the Omega Background**  
H. Y. Chen, P. S. Hsin and P. Koroteev.  
arXiv:[1305.5614](#)  
*JHEP* **1308**, 076 (2013)
15. **Statistical mechanics of Coulomb gases as quantum theory on Riemann surfaces**  
T. Gulden, M. Janas, P. Koroteev and A. Kamenev.  
arXiv:[1303.6386](#) [cond-mat.stat-mech]  
*J. Exp. Theor. Phys.* **117**, 517 (2013)
14. **BPS States in Omega Background and Integrability**  
K. Bulycheva, H. Y. Chen, A. Gorsky and P. Koroteev.  
arXiv:[1207.0460](#) [hep-th]  
*JHEP* **1210**, 116 (2012)
13. **On Extended Supersymmetry in Two and Four Dimensions**  
P. A. Koroteev.  
[PhD Thesis](#)
12. **Causality and Lifshitz holography**  
P. Koroteev.  
*Nucl. Phys. Proc. Suppl.* **216**, 245 (2011).
11. **Quantum Dynamics of Low-Energy Theory on Semilocal Non-Abelian Strings**  
P. Koroteev, M. Shifman, W. Vinci and A. Yung.  
arXiv:[1107.3779](#) [hep-th]  
*Phys. Rev. D* **84**, 065018 (2011)
10. **Large-N Solution of the Heterotic Weighted Non-Linear Sigma-Model**  
P. Koroteev, A. Monin and W. Vinci.

- arXiv:[1009.6207](#) [hep-th]  
*Phys. Rev. D* **82**, 125023 (2010)
9. **On the Null Energy Condition and Causality in Lifshitz Holography**  
 C. Hoyos and P. Koroteev.  
 arXiv:[1007.1428](#) [hep-th]  
*Phys. Rev. D* **82**, 084002 (2010), *Erratum: [Phys. Rev. D* **82**, 109905 (2010)]
  8. **Large-N Solution of the Heterotic  $N=(0,1)$  Two-Dimensional  $O(N)$  Sigma Model**  
 P. Koroteev and A. Monin.  
 arXiv:[1003.2645](#) [hep-th]  
*Phys. Rev. D* **81**, 105001 (2010)
  7. **Wilson Loops in Gravity Duals of Lifshitz-like Theories**  
 P. Koroteev and A. V. Zayakin.  
 arXiv:[0909.2551](#) [hep-th]  
 ITEP-TH-40-09, FTPI-MINN-09-33, UMN-TH-2813-09
  6. **Comments on Holography with Broken Lorentz Invariance**  
 I. Gordeli and P. Koroteev.  
 arXiv:[0904.0509](#) [hep-th]  
*Phys. Rev. D* **80**, 126001 (2009)
  5. **Spectra of Field Fluctuations in Braneworld Models with Broken Bulk Lorentz Invariance**  
 P. Koroteev and M. Libanov.  
 arXiv:[0901.4347](#) [hep-th]  
*Phys. Rev. D* **79**, 045023 (2009)
  4. **Integrable systems and quantum deformations**  
 P. Koroteev.  
[AIP Conf. Proc.](#) **1182**, 513 (2009).
  3. **Quantum Deformations of the One-Dimensional Hubbard Model**  
 N. Beisert and P. Koroteev.  
 arXiv:[0802.0777](#) [hep-th]  
*J. Phys. A* **41**, 255204 (2008)
  2. **On Existence of Self-Tuning Solutions in Static Braneworlds without Singularities**  
 P. Koroteev and M. Libanov.  
 arXiv:[0712.1136](#) [hep-th]  
*JHEP* **0802**, 104 (2008)
  1. **Morse theory in field theory**  
 P. Koroteev and A. V. Zayakin.  
[hep-th/0508153](#)  
*Softex, Sofia, Bulgaria, (2007) 207-220.*

## Invited talks

- 2023 Workshop Elliptic Integrable Systems, Representation Theory, and Hypergeometric Functions, Tokyo, Japan  
Workshop Dualities and Symmetries in Integrable Systems, Sabhal Mor Ostaig, Isle of Skye, Scotland, UK  
Workshop Gauge Linear Sigma Models at 30, Simons Center for Geometry and Physics, Stony Brook, NY  
Workshop 50 Years of Supersymmetry, University of Minnesota, MN
- 2022 Australia Math Physics Colloquium (over zoom)  
Math Physics Seminar, University of Queensland, Australia  
Mathematics Colloquium, Australian National University, Canberra, Australia  
Math Physics Seminar, University of Melbourne, Australia  
M-Seminar, Kansas State University (over zoom)  
2022 Aspen Conference on Geometrization of  $D < 7$  Theories
- 2021 Mathematical Physics seminar, Purdue University, Department of Mathematics, West Lafayette, IN  
String Theory Seminar, Trinity College, Dublin, Ireland  
Mathematical Physics Seminar, CRM, Montreal, QC, Canada  
Online Geometry and Physics Seminar, Institute for Advanced Study in Mathematics, Zhejiang University, Zhejiang, China [\[link\]](#)
- 2020 Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada  
Mathematical Physics Seminar, University of North Carolina, Chapel Hill, NC  
Joint AMS Meeting, Denver, CO  
Algebra and Geometry seminar, California Institute of Technology, Pasadena, CA
- 2019 Workshop “Geometric Representation Theory and Quantum Field Theories”, Tsinghua  
Sanya International Mathematics Forum, Sanya, China  
Geometry, Physics, and Representation Theory Seminar, Northeastern University, Boston, MA  
Workshop “BPS/CFT Correspondence”, Centre International de Rencontres Mathématiques, Marseille, France [\[link\]](#)  
Conference “Verlinde Algebra and Grassmannian”, Sun Yatsen University, Guangzhou, China. [\[link\]](#)[\[slides\]](#)  
Conference ‘Non-Local Aspects of Holomorphic and Topological Field Theory’, IHES, France. [\[link\]](#)  
Workshop ‘Representation theory, gauge theory and integrable systems’, Kavli IPMU, University of Tokyo, Japan. [\[link\]](#)
- 2018 Conference on Quantum K-theory and related topics. Korean Institute for Advanced Study, Seoul, Korea [\[link\]](#)  
Workshop ‘Exactly Solvable Models of Quantum Field Theory and Statistical Mechanics’. Simons Center for Geometry and Physics, Stony Brook, NY  
High Energy Physics seminar. Arizona State University, Department of Physics, Phoenix, AZ  
Algebraic Geometry seminar. Arizona State University, Department of Mathematics, Phoenix, AZ

- Mirror Symmetry group seminar. Kansas State University, Manhattan, KS  
 Workshop “SCFTs in 6 and lower dimensions”. The Yau Mathematical Sciences Center at Tsinghua University [\[slides\]](#)
- 2017 The Yau Mathematical Sciences Center at Tsinghua University, Beijing, China  
 Informal Mathematical Physics Seminar. Columbia University, Department of Mathematics [\[link\]](#)  
 High Energy Physics seminar. Arizona State University, Department of Physics, Phoenix, AZ  
 XXVth International Conference on Integrable Systems and Quantum symmetries. Prague, Czech Republic  
 Theory group lunch seminar. University of Amsterdam, Amsterdam, Netherlands
- 2016 High energy theory seminar. Uppsala University, Uppsala, Sweden  
 School and Workshop on Geometric Correspondences of Gauge Theories, ICTP, Trieste, Italy [\[slides\]](#)[\[video\]](#)  
 Colloquium at University of Virginia, Department of Mathematics, Charlottesville, VA  
 Geometry and Physics Seminar, University of Texas, Austin, TX  
 High Energy Physics Seminar, University of Toronto, Toronto, ON, Canada  
 Korean Institute for Advanced Study, String seminar, Seoul, Korea  
 9th Taiwan String Workshop, Taipei, Taiwan  
 International Seminar ‘Quarks-2016’, Pushkin, Russia  
 String Theory Seminar, University of California at Davis, CA  
 Continuous Advances in QCD 2016, Minneapolis, MN [\[slides\]](#)
- 2015 Korean Institute for Advanced Study, String seminar, Seoul, Korea  
 Kavli Institute of Physics and Mathematics of the Universe, String seminar, Kashiwa, Japan  
 California Institute of Technology, High energy physics seminar, Pasadena, CA  
 CERN, High energy physics seminar, Geneva, Switzerland  
 Workshop on Classical and Quantum Integrable Systems, Protvino, Russia  
 String/high energy seminar at Imperial College, UK  
 Workshop on Geometric Correspondences of Gauge Theories 5, SISSA, Trieste, Italy [\[site\]](#)
- 2014 High energy physics group seminar, University of Toronto, Toronto, ON  
 Fine Theoretical Physics Institute Seminar, University of Minnesota  
 High Energy seminar, CERN, Switzerland  
 Workshop on Geometric Correspondences of Gauge Theories 4, SISSA, Trieste, Italy  
 Seminar at Simons Center for Geometry and Physics, Stony Brook, NY [\[video\]](#)  
 String seminar, University of California, Berkeley  
 Talk at New Methods in Nonperturbative Quantum Field Theory, Kavli Institute for Theoretical Physics, Santa Barbara [\[video\]](#)  
 High energy physics group seminar, University of South California  
 Theory group seminar, University of Texas, Austin  
 High energy physics group seminar, California Institute of Technology  
 String Theory seminar, University of California, Berkeley
- 2013 High energy physics group seminar, University of Minnesota, Duluth  
 Quiver Varieties Program seminar, SCGP, Stony Brook University [\[video\]](#)

- String theory seminar at Oxford University, UK  
 String theory seminar at DAMTP, Cambridge University, UK  
 High energy seminar at Queen Mary College, UK  
 String/high energy seminar at Imperial College, UK  
 Great Lakes Strings conference, University of Kentucky [\[video\]](#)  
 Continuous Advances in QCD, University of Minnesota [\[slides\]](#)  
 2012 Workshop on Integrability in Modern Theoretical and Mathematical Physics, SCGP,  
 Stony Brook University [\[video\]](#)  
 High energy physics group seminar, University of Toronto  
 High energy physics group seminar, California Institute of Technology  
 Workshop on N=2 Jeometry And ApplicationZ, McGill University, Montreal [\[slides\]](#)  
 Theory group seminar. McGill University, Montreal [\[abstract\]](#)  
 2011 Continuous Advances in QCD, University of Minnesota [\[slides\]](#)  
 Theory group seminar. University of Victoria  
 2010 High Energy group seminar. University of British Columbia, Vancouver  
 2008 Elementary particle physics group seminar, Niels Bohr Institute, Copenhagen  
 String theory group seminar, Utrecht University  
 String seminar, Imperial College, London

#### Lecture courses

- 2014 Duluth Winter School 2014 on Supersymmetry and String Theory [\[link\]](#). Week long  
 lecture course on Supersymmetry and String Theory [\[notes\]](#).

#### References

1. **Andrei Okounkov**  
 Columbia University, New York, NY  
 Phone: +1 (212)-854-3988  
 Email: [jokounkov@math.columbia.edu](mailto:jokounkov@math.columbia.edu)
2. **Hiraku Nakajima**  
 Kavli Institute for the Physics and Mathematics of the Universe, Tokyo, Japan  
 Email: [nakajima@math.kyoto-u.ac.jp](mailto:nakajima@math.kyoto-u.ac.jp)
3. **Yan Soibelman**  
 Kansas State University, Manhattan, KS  
 Phone: +1 (785) 532-6750  
 Email: [soibel@math.ksu.edu](mailto:soibel@math.ksu.edu)
4. **Edward Frenkel**  
 University of California, Berkeley, CA  
 Phone: +1 (510) 642-6550  
 Email: [frenkel@math.berkeley.edu](mailto:frenkel@math.berkeley.edu)

5. **Nikita Nekrasov**  
Simons Center for Geometry and Physics, Stony Brook, NY  
Phone: +1 (612)-626-0814  
Email: [nnekrasov@scgp.stonybrook.edu](mailto:nnekrasov@scgp.stonybrook.edu)
6. **Kevin Costello**  
Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada  
Phone: +1 (519) 569-7600  
Email: [kcostello@perimeterinstitute.ca](mailto:kcostello@perimeterinstitute.ca)
7. **Davide Gaiotto**  
Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada  
Phone: +1 (519) 569-7600 5004  
Email: [dgaiotto@gmail.com](mailto:dgaiotto@gmail.com)
8. **Albert Schwarz**  
University of California, Davis, CA  
Phone: +1 (530) 752-1079  
Email: [schwarz@math.ucdavis.edu](mailto:schwarz@math.ucdavis.edu)
9. **Mina Aganagic**  
University of California, Berkeley, CA  
Phone: +1 (510) 642-7186  
Email: [aganagic@berkeley.edu](mailto:aganagic@berkeley.edu)
10. **David Morrison**  
University of California, Santa Barbara, CA  
Phone: +1 (805) 893-8309  
Email: [drm@math.ucsb.edu](mailto:drm@math.ucsb.edu)
11. **Alexander Voronov**  
University of Minnesota, Department of Mathematics, Minneapolis, MN  
Phone: +1 (612)-624-0355  
Email: [voronov@umn.edu](mailto:voronov@umn.edu)

...