

Nikita Sopenko

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Personal Information

DATE OF BIRTH: April 24, 1995
CITIZENSHIP: Russian

Employment

Institute for Advanced Study, Princeton, NJ, USA
Member, September 2023 - present

Education

California Institute of Technology, USA
Ph.D. in Physics, 2018 - 2023
ADVISOR: Anton Kapustin

Moscow Institute of Physics and Technology, Russia
B.S. and M.S. in Physics (*summa cum laude*), 2012 - 2018

RESEARCH INTERESTS: mathematical physics, operator algebra, quantum statistical mechanics, quantum field theory.

Honors and Awards

- Robert F. Christy Prize for Outstanding Doctoral Thesis in Theoretical Physics, California Institute of Technology (2023)
- John S. Stemple Memorial Prize for outstanding progress in research as demonstrated by an excellent performance on the oral candidacy exam, California Institute of Technology (2021)
- Dominic Orr Graduate Fellowship, California Institute of Technology (2018-2023)
- Academic Council fellowship, Moscow Institute of Physics and Technology (2015-2018)
- Abramov-Frolov fellowship, Moscow Institute of Physics and Technology (2012-2015)
- Young scientists scholarship, Institute for Theoretical and Experimental Physics (2014-2018)
- Gold medal at 43rd International Physics Olympiad (2012)
- European Physical Society Award for the Absolute winner of the Physics Cup - IPhO (2012)
- Gold medal at 13th Asian Physics Olympiad (2012)
- Gold medal and best result for the experimental exam, Romanian Masters of Physics (2012)
- Silver medal at 42nd International Physics Olympiad (2011)
- First Prize at All-Russian Physics Olympiad (2010, 2011, 2012)
- Second Prize at All-Russian Mathematics Olympiad (2010, 2012)

List of publications

- *Reflection positivity and a refined index for 2d invertible phases*
N. Sopenko
preprint arXiv:2509.01711

- *Optimal Bound on Long-Range Distillable Entanglement*
 Jonah Kudler-Flam, Vladimir Narovlansky, Nikita Sopenko
 Phys. Rev. Lett. 135, 060403 (2025)
- *An index for invertible phases of two-dimensional quantum spin systems*
 N. Sopenko
 preprint arXiv:2410.02059
- *Anomalous symmetries of quantum spin chains and a generalization of the Lieb-Schultz-Mattis theorem*
 A. Kapustin, N. Sopenko
 Communications in Mathematical Physics, Volume 406, article number 238, (2025)
- *Quantization of the higher Berry curvature and the higher Thouless pump*
 A. Artymowicz, A. Kapustin, N. Sopenko
 Communications in Mathematical Physics, Volume 405, article number 191, (2024)
- *Chiral topologically ordered states on a lattice from vertex operator algebras*
 N. Sopenko
 Advances in Theoretical and Mathematical Physics Vol.28, no.1 (2024)
- *Local Noether theorem for quantum lattice systems and topological invariants of gapped states*
 A. Kapustin, N. Sopenko
 Journal of Mathematical Physics, Volume 63, Issue 9, 091902 (2022) [Editors Pick]
 (special collection on Mathematical Aspects of Topological Phases)
- *An index for two-dimensional SPT states*
 N. Sopenko
 Journal of Mathematical Physics, Volume 62, Issue 11, 111901 (2021)
- *A classification of phases of bosonic quantum lattice systems in one dimension*
 A. Kapustin, N. Sopenko, B. Yang
 Journal of Mathematical Physics, Volume 62, Issue 8, 081901 (2021)
- *Hall conductance and the statistics of flux insertions in gapped interacting lattice systems*
 A. Kapustin, N. Sopenko
 Journal of Mathematical Physics, Volume 61, Issue 10, 101901 (2020) [Editors Pick]
- *Rozansky-Witten geometry of Coulomb branches and logarithmic knot invariants*
 S. Gukov, P.S. Hsin, H. Nakajima, S. Park, D. Pei, N. Sopenko
 Journal of Geometry and Physics, Volume 168, 104311 (2021)

- *3d-3d correspondence for mapping tori*
S. Chun, S. Gukov, S. Park, N. Sopenko
Journal of High Energy Physics, 2020 (9), pp.1-60
- *Bands and gaps in Nekrasov partition function*
A. Gorsky, A. Milekhin, N. Sopenko
Journal of High Energy Physics, 2018 (1), pp.1-43
- *Surface defects and instanton-vortex interaction*
A. Gorsky, B. Le Floch, A. Milekhin, N. Sopenko
Nuclear Physics B, 920, pp.122-156 (2017)
- *The Condensate from Torus Knots*
A. Gorsky, A. Milekhin, N. Sopenko
Journal of High Energy Physics 2015 (9), pp.1-41

Conferences and Seminars

- Simons Collaboration on Global Categorical Symmetries Satellite Meeting, New York University (November 2025)
- City College of New York, Physics department seminar (September 2025)
- Workshop on Quantum Field Theory and Topological Phases via Homotopy Theory and Operator Algebras, Harvard university (July 2025)
- Center of Mathematical Sciences and applications, Quantum Field Theory and Physical Mathematics Seminar, Harvard university (May 2025)
- Simons Center for Geometry and Physics, Journal Club, Stony Brook (March 2025)
- Rutgers University, New High Energy Theory Center (October 2024)
- Institute for Advanced Study CMP/QFT Seminar, Princeton (October 2024)
- University of Colorado Boulder, C^* -Algebraic Quantum Mechanics and Topological Phases of Matter, Lectures (July 2024)
- University of Chicago, Kadanoff seminar, Chicago (May 2024)
- Institute for Advanced Study CMP/QFT Seminar, Princeton (February 2024)

- CREST Tutorial Workshop "Theoretical studies of topological phases of matter", Japan (February 2024)
- Mathematical Physics Seminar, Princeton University (November 2023)
- Simons Center for Geometry and Physics, Physics Seminar, Stony Brook University (November 2023)
- Institute for Advanced Study High Energy Theory Seminar, Princeton (October 2023)
- QMAP seminar, UC Davis (May 2023)
- Seminar, Beijing Institute of Mathematical Sciences and Applications (April 2023)
- Condensed Matter Seminar, Perimeter institute (December 2022)
- Workshop "Topology and Entanglement in Many-Body Systems", Banff International Research Station, (October 2021)
- Seminar on non-perturbative methods in quantum field theory, IITP and Landau ITP, Moscow (October 2021)
- Global Non-commutative Geometry seminar, (May 2021)
- Seminar on non-perturbative methods in quantum field theory, IITP and Landau ITP, Moscow (July 2020)
- Seminar on representation theory and mathematical physics, Higher school of economics and Skoltech (2018)
- Séminaire de Physique Théorique, Institut des Hautes Études Scientifiques, Paris, France (April 2017)
- Seminar "Modern problems in quantum field theory", HSE Moscow (October 2015)

Research stays

- Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA (6 weeks, 2017)
- Institut des Hautes Études Scientifiques, France (5 weeks, 2017)

Teaching Experience

- Teaching Assistant at Caltech 2020-2023
 - PH232 Introduction to Topological Field Theory
 - PH229 Advanced Mathematical Methods of Physics
 - PH219 Quantum Computation
 - PH127 Statistical Physics
- Teaching Assistant at Moscow Institute of Physics and Technology 2018
 - Methods of Mathematical Physics
- Member of the academic committee of 18th Asian Physics Olympiad (2017)
- 2012 & 2013 International Physics Olympiad Russian team coach

Professional service

Referee for

- National Science Foundation proposals
- Communications in Mathematical Physics
- Reviews in Mathematical Physics
- Journal of High Energy Physics (JHEP)
- Physical Review Letters
- Physical Review B
- Physical Review D

LAST UPDATED: DECEMBER 16, 2025