

Anastasiia Tsvietkova

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Appointments

Continuing

Assistant Professor, t.-track, Rutgers University, Newark, NJ, USA 09/2016 – present

Temporary or Past

Von Neumann Fellow, Institute of Advanced Study, Princeton 09/2020 – 08/2021

Assistant Professor and Head of Geometry and Topology of Manifolds Unit, OIST (research institute), Japan 09/2017 – 08/2019

Krener Assistant Professor (non t.-track), University of California, Davis 01/2014 – 08/2016

Postdoctoral Fellow, ICERM, Brown University (Semester program in Low-dimensional Topology, Geometry, and Dynamics) Fall 2013

NSF VIGRE Postdoctoral Researcher, Louisiana State University 08/2012 – 08/2013

Education

PhD in Mathematics, University of Tennessee, 05/2012, distinguished by Grad. Academic Achievement Award
Thesis: *Hyperbolic structures from link diagrams*. Advisor: Morwen Thistlethwaite.

Master's degree with Honors in Applied Mathematics, Kiev National University, Ukraine, 07/2007
Thesis: *Decomposition of cellular balleans into direct products*. Advisor: Ihor Protasov.

Bachelor's degree with Honors in Applied Mathematics, Kiev National University, Ukraine, 05/2005
Thesis: *Asymptotic Rays*. Advisor: Ihor Protasov. GPA 5.0/5.0

Research Interests: low-dimensional topology and geometry, knot theory, computational topology, hyperbolic geometry

Academic Honors, Grants and Other Funding

- NSF CAREER grant "*CAREER: 3-manifolds with finite volume, their geometry, representations, and complexity*", DMS-2142487, \$467,237, 2022-present
- NSF grant (sole PI), *Geometry, Topology and Complexity of 3-manifolds*, DMS-2005496, \$213,906, 2020-present
- NSF grant (sole PI), *Hyperbolic Structures from Link Diagrams*, DMS-1406588, \$113,000, 2014-2019
- Okinawa Institute of Science and Technology research unit funding (sole PI), *Geometry and Topology of Manifolds unit*, ~\$660,000, 2016-2019
- NSF conference grant (co-PI with Joel Hass), DMS-1758107, \$17,000, 2017-2018
- Conference grants (x 2) from Okinawa Institute of Science and Technology (sole PI), ~\$127 000, for a workshop and a mini-symposium, 2018
- NSF-AWM Mathematics Mentoring Travel Grant recipient (the grant funded research visits to the University of Oxford), \$5,000, 2013
- Geometric Structures and Representation Varieties (GEAR) member. GEAR was funded by the NSF grant DMS-1107452, to bring together researchers from US, Canada, Europe and Asia. Individual subawards: 12/2012, research visit to Columbia University; 10/2015, research stay at Institute of Advanced Study, Princeton.
- USTARS Distinguished Graduate Student Award, 04/2012
- AMS Travel Grants recipient, 10/2011 and 01/2012
- AWM Travel Grant recipient, 01/2012
- University of Tennessee Travel Awards, 01/2011 and 05/2011
- University of Tennessee Science Alliance Fellowship, 2006-2008, 2009-2011
- A winner of the Microsoft Imagine Cup competition, Software design category, Ukraine, 2006
- Presidential Fellowship for exceptional undergraduate students (full scholarship covering tuition, fees, housing and stipend; 100 per year are awarded throughout Ukraine), Ukraine, 2001-2005
- Placed 1st, 2nd and 3rd in Math Olympiads and Junior Academy of Sciences competitions in Ukraine in different years, 1998-2001

Papers and Preprints (all are peer-reviewed; authors are listed in alphabetical order)

1. *Standard position for surfaces in link complements in arbitrary 3-manifolds*, with J. Purcell, preprint, 27 pp. <https://arxiv.org/abs/2205.06368>
2. *Random meander model for links*, with N. Owad, preprint, 18 pp., <https://arxiv.org/abs/2205.03451>
3. *NP-hard problems naturally arising in knot theory*, with D. Koenig, *Trans. Amer. Math. Soc. Ser. B* 8 (2021), 420-441

4. *Tangle decompositions of alternating link complements*, with J. Hass and A. Thompson, Illinois J. Math. 65 (2021), no. 3, 533–545
5. *Unlinking, splitting, and some other NP-hard problems in knot theory*, with D. Koenig, Proceedings of the 2021 ACM-SIAM Symposium on Discrete Algorithms (SODA), SIAM (2021), 1496--1507
5. *Alternating links have at most polynomially many Seifert surfaces of fixed genus*, with J. Hass and A. Thompson, Indiana Univ. Math. J. 70 (2021), no. 2, 525-534
6. *Simplicial volume of links from link diagrams*, with O. Dasbach, Mathematical Proceedings Cambridge Philosophical Society 166 (2019), no. 1, 75–81
7. *Determining isotopy classes of crossing arcs in alternating links*, Asian Journal of Mathematics, Vol. 22, No. 6 (2018), 1005-1024
8. *The number of surfaces of fixed genus in an alternating link complement*, with J. Hass and A. Thompson, International Mathematics Research Notices 6 (2017), 1611-1622
9. *Intercusp geodesics and the invariant trace field of hyperbolic 3-manifolds*, with W. Neumann, Proceedings of the American Mathematical Society 14 (2016), No. 2, 887-896
10. *A refined upper bound for the hyperbolic volume of alternating links and the colored Jones polynomial*, with O. Dasbach, Mathematical Research Letters 22 (2015), No. 4, 1047-1060
11. *Exact volume of hyperbolic 2-bridge links*, Communications in Analysis and Geometry 22 (2014), No. 5, 881-896
12. *An alternative approach to hyperbolic structures on link complements*, with M. Thistlethwaite, Algebraic & Geometric Topology 14 (2014), 1307-1337
13. PhD thesis: *Hyperbolic Structures from Link Diagrams*, University of Tennessee (2012), 77 pp.
14. *Decomposition of Cellular Balleans*, with I. Protasov, Topology Proceedings 36 (2010), 77-83
15. *Asymptotic Rays*, with O. Kuchaiev, International J. of Pure and Applied Math. 56, No. 3 (2009), 353-358

In Preparation (available upon request)

16. *PSL(2, C)-representations of knot groups from knot diagrams*, with K. Petersen, 50-page preprint
17. *Universal bounds for surfaces in weakly generalized alternating link complements*, with J. Purcell, 20-page preprint
19. *On bit-computability and its extensions of DISCRETE-FREE SUBGROUP of PSL(2, R) problem*, with J. Gilman, 12-page preprint
20. *Polynomially many surfaces in terms of hyperbolic volume in a 3-manifold*, with M. Lackenby, 18-page preprint

Selected Software

21. *Hyperbolic structures from alternating link diagrams*. Implementation of an alternative method for computing hyperbolic structures of alternating links with small regions. Written in C++. <https://sites.rutgers.edu/anastasiia-tsvietkova/research/>
22. *Hyperbolic structures from link diagrams*, with D. Koenig and A. Lowen. A more general version of the above, for links with any region size, including non-alternating links. Written in Python, can be integrated with SnapPy. Now in the final stages of testing, to be posted on CompuTop.org.
23. *Computing invariant trace field from a link diagram, with no approximation involved*. Worksheet that gives the polynomial for the invariant trace field of a hyperbolic 2-bridge link. Written in Mathematica. <https://sites.rutgers.edu/anastasiia-tsvietkova/research/>
24. *Footstep*, with O. Kuchaiev, P. Protsyk, P. Shelyazhenko. Software system written as part of Microsoft Imagine Cup competition, placed first in Ukraine in 2006 .

Research Talks

Invited Conference Talks

- Sage Days Duluth, University of Minnesota Duluth (had to cancel due pandemic travel difficulties), 06/2022
- "Computational Aspects of Discrete Subgroups of Lie Groups" workshop (virtual), ICERM, Brown, 06/2021
- ACM-SIAM Symposium on Discrete Algorithms SODA (virtual), 01/2021
- Foundations of Computational Mathematics conference FoCM'20 (cancelled due to pandemic), Simon Fraser University, Canada, 06/2020
- Redbud Topology conference (an invited talk and a lecture for students), University of Arkansas, 3/2020
- Low-dimensional Topology workshop (a short talk), MFO, Oberwolfach, Germany, 2/2020
- Computational Problems in Low-dimensional Topology II, OIST, Japan, 4/2019
- Low dimensional topology and number theory XI, Osaka University, Japan, 3/2019
- Classical and Quantum 3-Manifold Topology workshop, Monash University, Australia, 12/2018
- ThompScharby Fest, UC Berkeley, USA, 7/2018
- Redbud Topology Conference (cancelled by me due to sickness), Oklahoma State University, 4/2018

- Ryukyu Knot Theory workshop, Naha, Okinawa, Japan, 1/2018
- "New developments in Teichmuller space theory" mini-symposium, OIST, Japan, 11/2017
- 51st Spring Topology and Dynamic Conference, NJ, Session on Geometric Topology, 3/2017
- Redbud Triangulations conference, Oklahoma State University, OK, 11/2016
- Knots in Hellas, Ancient Olympia, Greece, 7/2016
- Chico Topology Conference, California State University, Chico, 5/2016
- Workshop on Geometric Structures on 3-Manifolds, IAS, Princeton, 10/2015
- The Thin Manifold conference, University of Iowa, 8/2014
- International Meeting RSME-SCM-SEMA-SIMAI-UMI, Bilbao, Spain, Session on Geometric Topology, 7/2014
- Low dimensional topology, knots, and orderable groups, CIRM, Luminy-Marseille, France, 7/2013
- Low-dimensional Topology and Geometry in Toulouse, Toulouse Mathematics Institute, 6/2013
- Knots in Washington XXXIV, session on Geometric Aspects of Knot Theory, GWU, 12/2012
- GEAR Network Retreat, University of Illinois, Urbana-Champaign, 8/2012
- Moab Topology Conference, Utah State University, Moab, 5/2012
- USTARS, University of Iowa, Distinguished Graduate Student talk, 4/2012
- 46th Spring Topology and Dynamics, Low-dimensional Topology Session, Universidad Nacional Autónoma de México, Mexico, 3/2012
- Knots in Washington XXXIII, George Washington University, 12/2011
- Geometric Topology of Knots Workshop, Centro di Ricerca Matematica, Pisa, Italy, 5/2011
- 12th Chico Topology Conference, California State University, Chico, 6/2010

Invited Talks at AMS or JMM meetings (SS is Special Session)

- AMS Meeting, Purdue University, SS on Optimization, Complexity, and Real Algebraic Geometry, 03/2022
- AMS Meeting, University of Virginia, SS on Knots and Links in Low-Dimensional Topology, 03/2022
- JMM Meeting (virtual), SS on Geometry and Topology in Dimensions 3 and 4, 01/2021
- AMS meeting (virtual), Penn State University, SS on Geometry of Groups and 3-manifolds, 10/2020
- AMS meeting (cancelled in pandemic), CSU Fresno, SS on Algorithms in the Study of Hyperbolic 3-manifolds, 05/2020
- AMS meeting (cancelled in pandemic), CSU Fresno, SS on Complexity in Low dimensional topology, 05/2020
- AMS Meeting (cancelled in pandemic), University of Virginia, SS on Knots and Links in Low-Dimensional Topology, 03/2020
- JMM meeting, Denver, Colorado, SS Women in Topology, 1/2020
- AMS meeting, Bowdoin College, Maine, SS on Decomposing 3-manifolds, 9/2016
- AMS Meeting, CSU Fullerton, SS on Algebraic and Combinatorial Structures in Knot Theory, 10/2015
- AMS Meeting, University of Nevada, Las Vegas, SS on Knots and 3-manifolds, 4/2015
- AMS Meeting, University of Tennessee, SS on Number Theory and Topology, 3/2014
- AMS Meeting, Washington University, St. Louis, SS on Geometric Aspects of 3-Manifold Invariants, 10/2013
- AMS Meeting, Temple University, PA, SS on Geometric topology of knots and 3-manifolds, 10/2013
- AMS Meeting, Tulane University, New Orleans, SS on Combinatorial Methods in Knot Theory, 10/2012

Invited Colloquia Talks

- University of Miami, 2/2021
- Math Conversations, Institute of Advanced Study, Princeton, 02/2021
- University of Melbourne, Australia, 2/2018
- University of Auckland, New Zealand, 11/2017
- Monash University, Melbourne, Australia, 4/2016
- University of Sydney, Australia, 3/2016
- University of Queensland, Brisbane, Australia, 2/2016
- Dartmouth College, New Hampshire, 2/2016
- Rutgers University, Newark, New Jersey, 2/2016
- Oklahoma State University, Oklahoma, 2/2016
- California State University, Chico, 2/2016
- Okinawa Institute and Science and Technology, Japan, 1/2016
- New College of Florida, Florida, 11/2015
- Brigham Young University, Utah, 10/2014
- Women Advancing Arizona Mathematics Colloquium, University of Arizona, 3/2014
- University of Louisiana, Lafayette, 1/2013

Invited Seminar Talks

Michigan State University 11/2021 and 11/2015
 IAS Member seminar, Princeton, 12/2020
 CUNY Graduate Center 4/2020, 12/2016, and 12/2012
 University of Tokyo, Japan, 2/2019
 Monash University, Australia, 2/2018
 PATCH (Bryn Mawr, Haverford, Penn, and Temple) 03/2017
 California Institute of Technology 12/2015
 University of California, Los Angeles, 10/2015
 University of California, Davis, 10/2015, 6/2015, and 2/2014
 Temple University topology seminar, 09/2015
 Brigham Young University 10/2014 and 11/2011
 University of California, Santa Barbara 02/2014
 ICERM 11/2013
 University of Virginia 01/2012

University of Oklahoma 10/2021
 Australian Geometric Topology Webinar 10/2020
 Rutgers New Brunswick 2/2020 and 10/2016
 AIMR, Tohoku University, Japan, 4/2018
 University of Osaka, Japan, 12/2017
 GEAR seminar at Rutgers University, Newark, 1/2017
 University at Buffalo (SUNY) 11/2015
 University of South California 10/2015
 Columbia University 10/2015 and 9/2011
 Stanford University 10/2014
 University of Texas, Austin 09/2014 and 10/2011
 Brown University topology seminar, 12/2013
 LSU /U Iowa/UPenn /U Memphis/U Arkansas 09/2012
 University of Tennessee 02/2011

Supervising postdocs

A faculty mentor and contact for seven postdocs from different research areas working at IAS and Princeton Mathematics Department, 2020-2021

Supervised at OIST as a Head of Geometry and Topology of Manifolds group, 2017-2019:

- Dale Koenig, postdoctoral researcher (PhD from UC Davis 2017)
- Nicholas Owad, postdoctoral researcher (PhD from University of Nebraska 2016)
- Robert Tang, postdoctoral researcher (PhD from University of Warwick 2013)
- Tirasan Khandawit, postdoctoral researcher (PhD from MIT 2013)
- Linling Ru, postdoctoral visitor (PhD from University of Warwick 2014)

Supervising graduate students

- Graduate thesis adviser for Touseef Haider, Rutgers-Newark, in progress
- Alex Lowen, NSF-funded research associate for a semester project, Rutgers-Newark
- Co-supervised Thomas Burns (neuroscience student) through lab rotation system, OIST, Japan, Spring 2018
- A faculty mentor for graduate student Lorinda Leshock from University of Delaware through AWM mentor network, Fall 2016-Spring 2017
- Joint research/mentoring through NSF Vertical Integration of Research and Education: Kimberly S. D'Souza, Daniel Guillot, Ying Hu, Jun Peng, Chris Penn at Louisiana State University, Fall 2012 and Spring 2013.

Supervising undergraduate students

- Xiao Chen, Rutgers University Newark, summer 2022
- Silvia Jaramillo-Regalado at Rutgers-Newark, Summer 2020, through NSF-funded Garden State LS Alliance for Minority Participation
- Felipe Castellano-Macias, Northeastern University, internship at OIST, Japan, in Spring and Summer 2019
- Robert Hanson, University College London, internship at OIST, Japan, Summer and Fall 2018
- Ruying Bao, University of California, Davis, Winter, Spring and Fall 2014
 Currently a graduate student in Applied Mathematics, Princeton University.
- Sarah Seger at Louisiana State University, Fall 2012 and Spring 2013.
 Later completed PhD in Mathematics, Rice University.

Other Selected Professional Activities and Services**Conference co-organization**

- Two workshops are planned at Rutgers, Newark, NJ, sponsored by NSF CAREER grant, 2023 and 2025:
 - (1) Interactions between low-dimensional topology and algebraic geometry
 - (2) Interactions between low-dimensional topology and computer science
- Computational Problems in Low-dim. Topology I and II mini-symposiums, 3/2018 and 4/2019, OIST, Japan
- Geometry and Topology of 3-manifolds workshop, 05/2018, OIST, Japan
- Invariants in Low-dimensional Topology Special Session at the AMS Meeting, New York, 05/2017
- Geometry, Topology and Complexity of Manifolds, and Applications to Biology (Joelfest), UC Berkeley 05/2016
- Knots and 3-manifolds Special Session at the AMS Meeting, Las Vegas, NV, 04/2015

Colloquia/seminar co-organization

- Distinguished lectures in topology planned at Rutgers Newark, sponsored by NSF CAREER grant, 2022-2027
- Geometry, Topology and Dynamics seminar at OIST, Japan, Fall 2017 – Spring 2019
- Faculty lunch seminar at OIST, Japan, 2018

- Mathematics Colloquium, Rutgers University, Newark, Fall 2016-Spring 2017
- GEAR seminar in Teichmuller theory at Rutgers University, Newark, Fall 2016-Spring 2017
- Low-dimensional topology and geometry reading seminar for graduate students, UC Davis, 2014

Reviewer/Referee/Panelist

- Served on NSF grant panels in different years, reviewer for NSF proposals
- Referee for journals: Journal of the London Mathematical Society, Proceedings of American Mathematical Society, Algebraic and Geometric Topology (x4), Communications in Analysis and Geometry (x2), Geometriae Dedicata, Journal of Knot Theory and Ramifications, Experimental Mathematics, Michigan Math. Journal
- Referee for Computer Science conferences: WG 2020 (International Workshop on Graph-Theoretic Concepts in Computer Science), STOC 2021 (ACM Symposium on Theory of Computing)
- Reviewer for MathSciNet

Selected University Committees/Initiatives

At OIST, Japan: developed a proposal for international visiting faculty program; participated in mathematics hiring initiative aimed to attract international faculty; library committee; conference and workshop committee; computer science hiring committee; developing new graduate courses curricula

At Rutgers, Newark: library liaison for the department, university library committee, participated in faculty hiring and in development of new graduate and undergraduate courses curricula.

Work with high school students

- Helped to organize California State Summer School for Math and Science for talented high school students, Summer 2015 (included teaching a course)
- Helped to organize the UT Pro2Serve Math Contest for talented high school students, annually 2006-2011
- Helped to organize and conduct Math Olympiads for high school students in Ukraine, annually 2001-2006

Broadening participation of underrepresented groups

- Panelist/lunch discussion organizer for Women and Mathematics event for students and junior mathematicians at IAS, Princeton, 2021.
- A faculty mentor for students and junior mathematicians through Association for Women in Mathematics network and through Garden State Alliance for Minority Participation program at Rutgers.
- A third of students and postdocs I supervised (listed above) were from groups underrepresented in mathematics.
- Gave invited talks for broad mathematics audience at Association of Women in Mathematics events, Women Advancing Arizona Mathematics Colloquium, Underrepresented Students in Topology and Algebra Research symposium.
- One of the goals of Distinguished Lectures at Rutgers mentioned above (that I will organize) is to showcase the work of mathematicians from underrepresented groups

Teaching-related

- Mentor for a new graduate teaching assistant, University of Tennessee, Fall 2011
- Completed "The Best Practices in Teaching" program, The University of Tennessee, Fall 2006

Teaching Experience

Rutgers University, Newark

- *Three-manifolds and links*, undergraduate course, scheduled Fall 2022
- *Topics in low-dimensional topology and geometry*, graduate course, scheduled Fall 2022
- *Advanced Calculus II* (12 students), Spring 2022
- *Applied Calculus*, large (150 students) and small (30 students) lectures, Fall 2021
- *Geometry, Topology and Complexity of 3-manifolds* graduate course, Spring 2020
- *Foundations of Modern Mathematics* (25 students), Fall 2019
- *Knot Theory* (25 students), undergraduate course, Spring 2017
- *Calculus II* (30 students), Fall 2016

OIST, Japan. Co-instructor (with postdocs) on graduate special topics courses:

- *Hyperbolic Geometry*, Spring 2018
- *Algebraic Topology II*, Spring 2018
- *Geometry and Topology Seminar II*, Spring 2018
- *Intro to Topology and Algebraic Topology*, Fall 2017
- *Geometry and Topology Seminar I*, Fall 2017

Additionally, co-instructor on 3 individual study courses for graduate students.

University of California, Davis

- *Geometric Topology (graduate course)*, Spring 2016
- *Topology*, Spring 2016

- *Euclidean and non-Euclidean geometry*, about 60 third and fourth-year students, Winter 2016
- *History of Mathematics*, about 65 third and fourth-year students, Winter 2016
- *Topics in hyperbolic 3-manifolds*, graduate course, Spring 2015
- *Mini-course on hyperbolic geometry*, California State Summer School for Math and Science, 07/2015
- *Calculus III*, instructor (a large lecture, about 100 second and third-year students), Spring 2014
- *Calculus II*, instructor (a large lecture, about 100 first and second-year students), Spring 2014
- *Real Analysis III*, instructor, about 45 fourth-year students, Winter 2014

Louisiana State University

- *VIGRE Research Seminar: Algorithms in Knot Theory*, co-instructor, Fall 2012 and Spring 2013
- *History of Mathematics*, Spring 2013
- *Calculus I and Analytic Geometry*, Fall 2012

University of Tennessee

- *Statistical Reasoning*, Spring 2012
- *Calculus II*, Fall 2011, Spring 2011 and Fall 2010
- *Matrix Algebra*, teaching assistant, Fall 2011
- *Calculus I*, Spring 2010 and Fall 2009
- *Finite Mathematics*, Spring 2009
- *Precalculus*, Fall 2008
- *Basic Calculus*, instructor in Spring 2008; teaching assistant in Spring and Fall 2007
- *College Algebra*, teaching assistant, Fall 2006

Selected Conference/Workshop Participation (by invitation)

- Perspectives on Dehn Surgery, ICERM, Brown University, 07/2019
- PIMS Symposium on Geometry and Topology of 3-manifolds, University of British Columbia, Canada, 07/2015
- Groups, Geometry and 3-manifolds, University of California, Berkeley, 05/2014
- Wasatch Topology Conference, Park City, Utah, 08/2014
- Geometric Topology in Cortona INdAM Meeting, Italy, 06/2013
- The Topology of 3-dimensional Manifolds, Centre de Recherches Mathématiques, Montréal, Canada, 05/2013
- Recent Progress on Hyperbolic 3-Manifolds, University of Michigan, Ann Arbor, 05/2012
- Geometry and Topology Down Under, University of Melbourne, Australia, 08/2011

Professional Memberships: American Mathematical Society, Association of Women in Mathematics

Personal Information: US citizen; previously a citizen/resident of Ukraine, Lithuania, Japan

Leaves: parental leaves in 2015 and 2020

References (in alphabetical order):

Oliver Dasbach, Louisiana State University, Professor and Department Chair, kasten@math.lsu.edu

David Futер, Temple University, Professor, dfuter@temple.edu

David Gabai, Princeton University, Hughes-Rogers Professor of Mathematics, gabai@math.princeton.edu

Cameron Gordon, UT Austin, Professor and Sid W. Richardson Foundation Regents Chair, gordon@math.utexas.edu

Joel Hass, UC Davis, Distinguished Professor, hass@math.ucdavis.edu

Efstratia Kalfagianni, Michigan State University, Professor, kalfagia@math.msu.edu

Jessica Purcell, Monash University, Professor and Associate Dean of Research, jessica.purcell@monash.edu

Alan Reid, Rice University, Edgar Odell Lovett Professor and Department Chair, alan.reid@rice.edu

Jennifer Schultens, UC Davis, Professor (teaching reference), jcs@math.ucdavis.edu

Abigail Thompson, UC Davis, Distinguished Professor, thompson@math.ucdavis.edu