Alexander Kupers

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Academic appointments

Assistant Professor
University of Toronto at Scarborough, Toronto, Canada. *2020–present*

Benjamin Pierce Fellow
Harvard University, Cambridge, USA. *2017–2020*

Postdoctoral position
University of Copenhagen, Copenhagen, Denmark. *2016–2017*

Education

PhD in Mathematics
Stanford University, Stanford, USA. *2011–2016*

MSc in Mathematical Sciences
Utrecht University, Utrecht, the Netherlands. *2009–2011*

BSc in Mathematics
Utrecht University, Utrecht, the Netherlands. *2006–2009*

BSc in Physics
Utrecht University, Utrecht, the Netherlands. *2006–2009*

Awards, Scholarships & Prizes

Sloan Research Fellowship
Alfred P. Sloan Foundation. *2022–2024*

Early-career supplement
512250, Natural Sciences and Engineering Research Council of Canada. *2021–2026*

Discovery grant
512156, Natural Sciences and Engineering Research Council of Canada. *2021–2026*

Research Competitiveness Fund grant
University of Toronto at Scarborough. *2021*

Certificate of Excellence in Teaching
The Derek Bok Center for Teaching and Learning at Harvard University. *2019*

NSF Grant
DMS-1803766, New directions in homology of moduli spaces. *2018–2020*

AIM SQuaRE.
Research week at American Institute of Mathematics *2019*
with Jeremy Miller, Rohit Nagpal, Peter Patzt and Jennifer Wilson.

William R. Hewlett Fellowship
Stanford fellowship for Graduate Students. *2012–2016*

Halsey L. Royden, Jr. Endowed Graduate Fellowship
Research fellowship for summer 2012. *2012*

PWN Afstudeerprijs
Prize for best mathematical Master's thesis in the Netherlands in 2010-2011. *2011*

KNAW Jong Talent Aanmoedigingsprijs Theoretische Natuurkunde
Dutch prize for young talent in Theoretical Physics. *2007*

First place IMC
International Mathematics Competition for University Students. *2007*

Honourable Mention IPhO
International Physics Olympiad participant. *2005*

Published papers

Ben Knudsen and Alexander Kupers. "Embedding calculus and smooth structures" (2022). to appear in Geometry & Topology.

Alexander Kupers. "Zeeman's conjecture". *Grad. J. Math.* 6.1 (2021), pp. 35–42.

Alexander Kupers, Peter Patzt, and Jeremy Miller. "Improved homological stability for certain general linear groups" (2022). to appear in Proceedings of the LMS.

Alexander Kupers, Jeremy Miller, Peter Patzt, and Jennifer C. H. Wilson. "On the generalized Bykovskii presentation of Steinberg modules". *International Mathematics Research Notices.* (2020), rnab028.

Alexander Kupers and Oscar Randal-Williams. "Framings of $W_{g,1}$". *Q. J. Math* (2021), haaa057.

Manual Krannich, Alexander Kupers, and Oscar Randal-Williams. "An $\mathbf{H}P^2$-bundle over S^4 with nontrivial $\hat{A}$-genus". *Comptes Rendus. Mathématique* 359.2 (2021), pp. 149–154.

Inbar Klang, Alexander Kupers, and Jeremy Miller. "The May-Milgram filtration and E_k-cells". *Algebr. Geom. Topol.* 21.1 (2021), pp. 105–136.

Jeffrey Giansiracusa, Alexander Kupers, and Bena Tshishiku. "Characteristic classes of bundles of K3 manifolds and the Nielsen realization problem". *Tunis. J. Math.* 3.1 (2021), pp. 75–92.

Manuel Krannich and Alexander Kupers. "Some hermitian K-groups using geometry". *Proc. Amer. Math. Soc.* 149 (2021), pp. 2745–2752.

Alexander Kupers and Oscar Randal-Williams. "The cohomology of Torelli groups is algebraic". *Forum Math. Sigma* 8 (2020), Paper No. e64, 52.

Alexander Kupers and Oscar Randal-Williams. "On the cohomology of Torelli groups". *Forum Math. Pi* 8 (2020), e7, 83.

Alexander Kupers. "Homological stability for unlinked circles in a 3-manifold". *Q. J. Math.* 71.1 (2020), pp. 335–358.

Søren Galatius, Alexander Kupers, and Oscar Randal-Williams. "E_2-cells and mapping class groups". *Publ. Math. Inst. Hautes Études Sci.* 130 (2019), pp. 1–61.

Alexander Kupers. "Some finiteness results for groups of automorphisms of manifolds". *Geom. Topol.* 23.5 (2019), pp. 2277–2333.

Alexander Kupers. "Three applications of delooping to h-principles". *Geom. Dedicata* 202 (2019), pp. 103–151.

Alexander Kupers and Jeremy Miller. "Representation stability for homotopy groups of configuration spaces". *J. Reine Angew. Math.* 737 (2018), pp. 217–253.

Alexander Kupers and Jeremy Miller. "E_n-cell attachments and a local-to-global principle for homological stability". *Mathematische Annalen* (Mar. 2017).

Alexander Kupers and Jeremy Miller. "Homological stability for topological chiral homology of completions". *Adv. Math.* 292 (2016), pp. 755–827.

Alexander Kupers and Jeremy Miller. "Sharper periodicity and stabilization maps for configuration spaces of closed manifolds". *Proc. Amer. Math. Soc.* 144.12 (2016), pp. 5457–5468.

Alexander Kupers, Jeremy Miller, and Trithang Tran. "Homological stability for symmetric complements". *Trans. Amer. Math. Soc.* 368.11 (2016), pp. 7745–7762.

Alexander Kupers and Jeremy Miller. "Improved homological stability for configuration spaces after inverting 2". *Homology Homotopy Appl.* 17.1 (2015), pp. 255–266.

Alexander Kupers and Jeremy Miller. "Some stable homology calculations and Occam's razor for Hodge structures". *J. Pure Appl. Algebra* 218.7 (2014), pp. 1219–1223.

Preprints

Alexander Kupers. "Mapping class groups of manifolds with boundary are of finite type". `https://arxiv.org/abs/2204.019450`. 2022.

Alexander Kupers and Oscar Randal-Williams. "On the Torelli Lie algebra". `https://arxiv.org/abs/2106.16010`. 2021.

Manuel Krannich and Alexander Kupers. "On Torelli groups and Dehn twists of smooth 4-manifolds". `https://arxiv.org/abs/2105.08904`. 2021.

Mauricio Bustamante, Manuel Krannich, and Alexander Kupers. "Finiteness properties of automorphism spaces of manifolds with finite fundamental group". `https://arxiv.org/abs/2103.13468`. 2021.

Manuel Krannich and Alexander Kupers. "Embedding calculus for surfaces". `https://arxiv.org/abs/2101.07885`. 2021.

Alexander Kupers. "There is no topological Fulton-MacPherson compactification". `https://arxiv.org/abs/2101.07885`. 2020.

Alexander Kupers and Oscar Randal-Williams. "On diffeomorphisms of even-dimensional discs". `https://arxiv.org/abs/2007.13884`. 2020.

Søren Galatius, Alexander Kupers, and Oscar Randal-Williams. "E_∞-cells and general linear groups of infinite fields". `https://arxiv.org/abs/2005.05620`. 2020.

Mathieu Dutour Sikiric, Philippe Elbaz-Vincent, Alexander Kupers, and Jacques Martinet. "Voronoi complexes in higher dimensions, cohomology of $GL_N(\mathbb{Z})$ for $N \geq 8$ and the triviality of $K_8(\mathbb{Z})$". `https://arxiv.org/abs/1910.11598`. 2019.

Søren Galatius, Alexander Kupers, and Oscar Randal-Williams. "E_∞-cells and general linear groups of finite fields". `https://arxiv.org/abs/1810.11931`. 2018.

Mauricio Gomez Lopez and Alexander Kupers. "The homotopy type of the topological cobordism category". `https://arxiv.org/abs/1810.05277`. 2018.

Søren Galatius, Alexander Kupers, and Oscar Randal-Williams. "Cellular E_k-algebras". `https://arxiv.org/abs/1805.07184`. 2018.

Daniela Egas Santander and Alexander Kupers. "Comparing combinatorial models of moduli space and their compactifications". `https://arxiv.org/abs/1506.02725`. 2015.

Alexander Kupers. "Proving homological stability for homeomorphisms of manifolds". `https://arxiv.org/abs/1510.02456`. 2015.

Theses

Some finiteness results for groups of automorphisms of manifolds
PhD thesis, supervisor prof. S. Galatius *2016*

Higher string operations
MSc thesis, supervisor prof. dr. I. Moerdijk *2011*

The construction of a fibered spectrum representing twisted K-theory
BSc thesis, supervisor dr. A.G. Henriques *2009*

Experience

Supervision

MSc thesis supervision
University of Toronto *2022*
Daniel Carranza – A cubical approach to discrete homotopy theory.

MSc thesis supervision
University of Toronto *2022*
Mahmud Azam – Semi-direct products of ∞-operads.

Summer undergraduate research supervision
University of Toronto *2021*
Nischay Reddy – Vanishing results in graph homology.

MSc thesis supervision
University of Toronto *2021*
Jacob Taylor – Contactomorphism groups of overtwisted contact manifolds.

Undergradate research supervisor
Harvard University *2018–2020*

SURIM Mentor
Stanford University *2015*
Stanford Undergraduate Research Institute in Mathematics, mentoring three undergraduate students in research on combinatorial 3-manifold invariants.

Teaching

Assistant Professor

University of Toronto *2020–present*

- Various reading courses, on topological K-theory, algebraic topology, and homotopy theory.
- MAT1351HF (Higher categories with applications).
- MATC27F (Introduction to topology).
- MATC01F (Groups and symmetry).
- MAT1300HF (Differential topology, wrote lecture notes).
- MATB24F (Linear Algebra II).

Lecturer

Harvard University *2017–2020*

- Math 272x (Topics Course on Diffeomorphisms of Disks, wrote lecture notes),
- Math 21b (Linear Algebra),
- Math 231a (Algebraic Topology),
- Math 231br (Advanced Algebraic Topology, wrote lecture notes),
- Math 121b (Linear Algebra and Applications),
- Math 113 (Complex Analysis),
- Math 132 (Differential topology).

Course Assistent

University of Copenhagen *2017*

- Homological Algebra.

Teaching and Course Assistant

Stanford University *2011–2014*

- Math 51 (Linear Algebra and Multivariable Calculus),
- Math 171 (Fundamental Concepts of Analysis),
- Math 19 (Introductory Calculus).

Course Assistant

Utrecht University *2007–2011*

- Special Relativity,
- Mechanics 1,
- Basic Mathematics,
- Quantum Mechanics 1,
- Electromagnetism 1,
- Rings & Galois theory,
- Algebraic Topology,
- Integration Techniques,
- Group Theory,
- Riemann ζ-function and L-functions,
- Computer skills for Mathematicians,
- Linear Algebra for Earth Sciences.

IPhO mentor

Training Dutch team for International Physics Olympaid. *2007–2008*

Talks

Invited talks

Various institutions

- 2022 University of Melbourne Topology Seminar,
- 2022 Mittag–Leffler Semester,
- 2021 Princeton Algebraic Topology Seminar,
- 2021 McMaster Topology Seminar,
- 2021 University of Minnesota Colloquium,
- 2021 BIRS Workshop Cohomology of Arithmetic Groups,
- 2021 University of Toronto Geometry & Topology Seminar,
- 2021 Ranicki Memorial Conference,

- 2021 Warwick Topology Seminar,
- 2021 Columbia Geometry & Topology Seminar,
- 2021 Toronto Geometry & Topology Seminar,
- 2021 Notre Dame Topology seminar.
- 2021 UNAM Algebraic Topology Seminar
- 2021 Building Bridges seminar.
- 2020 CMS Winter Meeting,
- 2020 Münster Topology seminar,
- 2020 eAKTS,
- 2020 Northeastern Topology seminar,
- 2020 MIT Topology seminar,
- 2020 Toronto Colloquium,
- 2020 UC Berkeley Colloquium,
- 2020 University of Washington Colloquium,
- 2019 Brown Colloquium,
- 2019 Stanford Colloquium,
- 2019 BIRS Workshop on Embedding spaces,
- 2019 Clay Research Conference,
- 2019 Brandeis Topology seminar,
- 2019 UPenn Topology seminar,
- 2019 Workshop on Automorphisms of Manifolds at Bonn,
- 2019 Oberwolfach Workshop Homotopy Theory,
- 2019 SYM Conference,
- 2019 Cornell Topology Festival,
- 2019 University of Michigan Topology seminar,
- 2019 MIT Topology seminar,
- 2018 University of Tokyo special seminar,
- 2018 Postech Geometry & Topology seminar,
- 2018 University of Chicago Geometry & Topology seminar,
- 2017 MIT Topology seminar,
- 2017 Purdue Topology seminar,
- 2017 Columbia Geometry & Topology seminar,
- 2017 Stanford Topology seminar,
- 2017 Copenhagen Algebra/Topology seminar,
- 2017 Workshop on Floer Homology and Homotopy Theory at UCLA,
- 2017 Workshop on Cohomology of Arithmetic groups at Copenhagen,
- 2017 Münster Topology seminar,
- 2016 Stockholm Topology seminar,
- 2016 Oberwolfach Workshop Topologie,
- 2016 Michael Weiss Birthday conference,
- 2016 UQAM Geometry and Topology seminar,
- 2015 Purdue Topology seminar,
- 2015 UIUC Topology seminar,
- 2015 University of Chicago Topology seminar,
- 2015 Northwestern Topology seminar,
- 2015 John Hopkins Topology seminar,
- 2015 Wrinkles in Münich,
- 2015 Diffeomorphism groups workshop at Berkeley,
- 2015 Cologne Topology Seminar,
- 2015 40th Spring Lecture Series at University of Arkansas,
- 2014 CUNY topology seminar,
- 2013 Workshop on String Topology and related topics,
- 2013 Münster Topology seminar,
- 2012 Bonn Topology seminar,
- 2012 Lille Topology seminar.

Services

Organizing workshop "Spaces of manifolds: Algebraic and Geometric Approaches"
BIRS *2021-2022*

Colloquium organizer
University of Toronto *2021-2022*

Organizing workshop "Cellular E_k-algebras"
Oberwolfach *2021*

Organizing seminars
Harvard University *2018–2020*
Thursday seminar.

Organizing conference "Four manifolds: confluence of high and low dimensions"
Fields Institute *2018–2019*

Intensive undergraduate advising
Harvard University *2018–present*

Graduate admissions
Harvard University *2017–2018, 2019–present*

Organizing "Workshop on Cohomology of Arithmetic Groups"
Copenhagen University *2017*

Organizing seminars
Copenhagen University *2016–2017*
Algebra/Topology seminar, Smoothing Theory seminar.

Organizing "West Coast Algebraic Topology Summer School"
University of Oregon & University of Vancouver *2013–2014*

Organizing seminars
Stanford University *2011–2016*
String topology seminar, Chromatic homotopy theory seminar, Positive scalar curvature seminar, Topology progress seminar.

Organizing various math and physics competitions
Utrecht University *2006–2010*
PION 2007 (Dutch Physics Olympiad for Students), LIMO 2007 (Dutch Mathematics Olympiad for Students), BxMO 2009, 2010 (Benelux Mathematical Olympiad).