

Andrew Senger

CONTACT INFORMATION	Department of Mathematics Harvard University Science Center 1 Oxford Street Cambridge, MA 02138	senger@math.harvard.edu https://people.math.harvard.edu/~senger/
RESEARCH INTERESTS	Homotopy theory and its interactions—including with differential topology, algebraic geometry, and number theory.	
EMPLOYMENT	Harvard University , Cambridge, MA NSF Postdoctoral Fellow, July 2024–June 2025. Postdoctoral Fellow, July 2023–June 2024. NSF Postdoctoral Fellow, July 2021–June 2023.	
EDUCATION	Massachusetts Institute of Technology , Cambridge, MA Ph.D. in Mathematics, June 2021 Advisor: Haynes Miller Thesis: <i>Multiplicative Structures on Brown–Peterson Spectra at Odd Primes</i> University of Minnesota Twin Cities , Minneapolis, MN B.S. in Mathematics, May 2016 Summa cum laude, with high distinction	
PAPERS AND PREPRINTS	<i>Crystallinity for reduced syntomic cohomology and the mod $(p, v_1^{p^{n-2}})$ K-theory of \mathbb{Z}/p^n</i> with Jeremy Hahn and Ishan Levy. October 2024. 45 pages. arXiv:2409.20543 <i>Exact bounds for even vanishing of $K_*(\mathbb{Z}/p^n)$</i> with Achim Krause. October 2024. 10 pages. arXiv:2409.20523 <i>Examples of disk algebras</i> with Sanath Devalapurkar, Jeremy Hahn, Tyler Lawson and Dylan Wilson. February 2023. 8 pages. arXiv:2302.11702 <i>Inertia groups of $(n - 1)$-connected $2n$-manifolds</i> with Adela YiYu Zhang. November 2022. 33 pages. arXiv:2211.00782 <i>Obstruction theory and the level n elliptic genus</i> . Compositio Mathematica 159(9), 2000–2021. March 2022. 19 pages. arXiv:2203.13743 <i>Unstable homotopy groups</i> , an appendix to <i>How big are the stable homotopy groups of spheres?</i> by Robert Burklund. Joint with Robert Burklund. March 2022. arXiv:2203.00670 <i>Galois reconstruction of Artin–Tate \mathbb{R}-motivic spectra</i> with Robert Burklund and Jeremy Hahn. October 2020. 77 pages. arXiv:2010.10325 <i>Inertia groups in the metastable range</i> with Robert Burklund and Jeremy Hahn. To appear in American Journal of Mathematics . October 2020. 22 pages. arXiv:2010.09869 <i>Odd primary analogs of Real orientations</i> with Jeremy Hahn and Dylan Wilson. Geometry & Topology 27 (2023) 87–129. September 2020. 31 pages. arXiv:2009.12716	

On the high-dimensional geography problem with Robert Burklund. To appear in **Geometry & Topology**. July 2020. 28 pages. arXiv:2007.05127

On the boundaries of highly connected, almost closed manifolds with Robert Burklund and Jeremy Hahn. **Acta Mathematica** 231(2) (2023) 205–344. December 2019. 99 pages. arXiv:1910.14116

The Brown-Peterson spectrum is not $E_{2(p^2+2)}$ at odd primes. To appear in **Advances in Mathematics**. October 2017. 28 pages. arXiv:1710.09822

HONORS AND
AWARDS

2021–Present NSF Mathematical Sciences Postdoctoral Research Fellowship
2018–2021 NSF Graduate Research Fellowship
2016–2017 MIT Presidential Fellowship
2015–2016 Barry M. Goldwater Scholarship

SERVICE

Referee and short opinions for Cambridge Journal of Mathematics, Compositio Mathematica, Bulletin of the London Mathematical Society, Homology, Homotopy & Applications, Journal of Pure and Applied Algebra, and the Quarterly Journal of Mathematics.

Harvard graduate admissions committee. (2022, 2024)

Harvard qualifying exam committee. (2022, 2024)

TEACHING

Harvard Math 231BR, Spring 2024. Advanced Algebraic Topology.

Harvard Math 131, Fall 2023. Topological Spaces and Fundamental Group.

Harvard Math 231BR, Spring 2023. Advanced Algebraic Topology.

Harvard Math 231A, Fall 2022. Algebraic Topology.

MIT 18.03, Fall 2019. Differential Equations. Teaching Assistant.

ADVISING &
MENTORING

Advisor for Senior Thesis of Harvard undergraduates William McInroy (2022–2023) and Wittmann Goh (2023–2024).

Harvard Math Includes: Mentoring a small group of undergraduate students. (2024–2025).

MIT Grad-Undergrad Math Mentoring Initiative: Mentored an undergraduate student on how to apply to graduate school in mathematics, as well as what it is like. (2020)

Cofactor, MIT Mathematics: Served as mentor for incoming graduate student as they settled in to the department. (2020)

MIT Directed Reading Program: Guided an MIT undergraduate student in independent study of K-theory and the J homomorphism. (2019)

MIT PRIMES: Mentored two high-school students on elliptic curves and algebraic number theory. (2017)

SEMINARS
ORGANIZED

Two Towers Seminar, Harvard (Spring 2024–Ongoing).

Babytop Seminar, MIT, co-organized with Ishan Levy and Piotr Pstragowski. (Fall 2023-Spring 2024)

Deformation Theory Seminar, MIT, co-organized with Robert Burklund and Tim Large. (Spring 2020)

Algebraic Topology Seminar, MIT. (Spring 2019)

Juvitop Seminar, MIT, co-organized with Hood Chatham. (Fall 2017 – Fall 2018)

The topics of the seminar were:

- Fall 2018: Ambidexterity in Chromatic Homotopy Theory
- Spring 2018: Jacob Lurie’s Elliptic Cohomology II
- Fall 2017: Goodwillie Calculus and the EHP Spectral Sequence

Seminar on Hill-Hopkins-Ravenel’s solution to the Kervaire invariant one problem, University of Minnesota Twin Cities, co-organized with Tyler Lawson and Craig Westerland. (Spring 2016)

Arithmetic Moduli of Elliptic Curves Reading Seminar, University of Minnesota Twin Cities, co-organized with Chen Wan. (Spring 2015)

Abelian Varieties Reading Seminar, University of Minnesota Twin Cities, co-organized with Chen Wan. (Fall 2014)

INVITED
TALKS

Synthetic homotopy theory and the classification of highly-connected manifolds (4 talks), Homotopy methods in manifold theory masterclass, University of Copenhagen. (April 2024)

On the K-theory of \mathbb{Z}/p^n , Topology Seminar, MIT. (March 2024)

The mod (p, v_1) K-theory of \mathbb{Z}/p^n , Geometry & Topology Seminar, New Mexico State University. (November 2023)

The mod (p, v_1) K-theory of \mathbb{Z}/p^n , Topology Seminar, University of Chicago. (October 2023)

The mod (p, v_1) K-theory of \mathbb{Z}/p^n , Topology Seminar, Northwestern University. (October 2023)

The mod (p, v_1) K-theory of \mathbb{Z}/p^n , Workshop on Generalised Lie algebras in Derived Geometry, Utrecht. (June 2023)

Equivariant power operations and fixed points of Morava E-theories, Topology Seminar, Johns Hopkins University. (April 2023)

Equivariant power operations and fixed points of Lubin-Tate theories, Topology Seminar, MIT. (March 2023)

E_∞ multiplications on Johnson–Wilson spectra, Conference on homotopy theory with applications to arithmetic and geometry, Fields Institute. (June 2022)

\mathbb{E}_∞ -structures on Johnson–Wilson spectra, Union College mathematics conference, Union College. (June 2022)

On the classification of metastably connected manifolds, Seminar on manifolds, homotopy theory, and related topics, Zoom. (June 2022)

\mathbb{E}_∞ -structures on Johnson–Wilson theories, Topology Seminar, University of Chicago. (May 2022)

\mathbb{E}_∞ -structures on Johnson–Wilson spectra, Topology Seminar, MIT. (March 2022)

Classification of Manifolds and Homotopy Theory, Manifolds and K-theory: the legacy of Andrew Ranicki, International Centre for Mathematical Sciences. (June 2021)

On the classification of highly-connected manifolds, Topology Seminar, University of Münster. (June 2021)

Artin–Tate \mathbb{R} -motivic spectra, Algebra/Topology Seminar, University of Copenhagen. (December 2020)

Boundaries of highly connected, almost closed manifolds, Topology Seminar, University of Bonn. (December 2020)

Artin–Tate \mathbb{R} -motivic spectra, Algebraic Topology Seminar, UCLA. (November 2020)

Artin–Tate \mathbb{R} -motivic spectra, Algebraic Topology Seminar, University of Michigan. (November 2020)

Artin–Tate \mathbb{R} -motivic spectra, Topology Seminar, University of Notre Dame. (September 2020)

CONFERENCES AND WORKSHOPS ATTENDED Beyond the telescope conjecture, Isaac Newton Institute for Mathematical Sciences. (Planned, June 2025)

Hot Topics: Life after the Telescope Conjecture, MSRI. (Planned, December 2024)

Chromatic homotopy theory and p -adic geometry, American Institute of Mathematics. (Planned, December 2024)

Homotopical methods in manifold theory, University of Copenhagen. (April 2024)

Workshop on p -adic Arithmetic Geometry (Spring), IAS. (March 2024)

2024 Simons Collaboration on Perfection in Algebra, Geometry and Topology Annual Meeting, Simons Foundation. (March 2024)

Homotopy: Fruit of the Fertile Furrow, Isaac Newton Institute for Mathematical Sciences. (June 2023)

A Panorama of Homotopy Theory — A Conference in Honour of Mike Hopkins, Oxford University. (June 2023)

Workshop on Generalised Lie algebras in Derived Geometry, Utrecht. (May 2023)

Homotopy Theory in Honor of Paul Goerss, Northwestern University. (March 2023)

Conference on Homotopy Theory with Applications to Arithmetic and Geometry, Fields

Institute. (June 2022)

Union College Mathematics Conference, Union College. (June 2022)

Manifolds and K-theory: the legacy of Andrew Ranicki, International Centre for Mathematical Sciences, Edinburgh. (June 2021)

Geometric Representation Theory and Equivariant Elliptic Cohomology, AMS MRC, Rhode Island. (June 2019)

Arbeitsgemeinschaft: Elliptic Cohomology according to Lurie, Mathematisches Forschungsinstitut Oberwolfach. (April 2019)

Arizona Winter School 2019: Topology and Arithmetic, University of Arizona, Tucson. (March 2019)

Chromatic Homotopy Theory Journey to the Frontier, University of Colorado Boulder. (May 2018)

Homotopy theory: tools and applications, University of Illinois at Urbana-Champaign. (July 2017)

Talbot 2017: Obstruction theory for structured ring spectra, Gooding, Idaho. (May 2017)

Introductory Workshop: Algebraic Topology, Mathematical Sciences Research Institute. (January 2014)