

Maxine Elena Calle

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EDUCATION

University of Pennsylvania

Ph.D. Candidate in Mathematics

NSF Graduate Research Fellow

– Thesis advisor: Mona Merling

– Thesis topic: Equivariant algebraic K -theory of orbispaces

M.A. in Mathematics

– Thesis advisor: Jonathan Block

– Thesis title: “An Introduction to Symplectic Geometry for Lagrangian Floer Homology”

Philadelphia, PA

2020–current

2022

Reed College

B.A. in Mathematics, concentration in Philosophy

Phi Beta Kappa

– Thesis advisor: Kyle Ormsby

– Thesis title: “Morse Theory and Flow Categories”

Portland, OR

2016–2020

RESEARCH INTERESTS

Algebraic topology, category theory, and homotopy theory. Especially higher algebraic K -theory, equivariant stable homotopy theory, and applications to manifolds.

PAPERS AND PUBLICATIONS

Research publications and preprints

- *Squares K -theory and 2-Segal spaces*. Joint with M. Sarazola. With appendix “A note on Waldhausen’s Additivity Theorem for squares K -theory.” 2024. 44 pages. Available at arXiv:2409.16428.
- *Nested cobordisms, Cyl-objects and Temperley-Lieb algebras*. Joint with R.S. Hoekzema, L. Murray, N. Pacheco-Tallaj, C. Rovi, and S. Sridhar-Shapiro. 2023. 36 pages. Available at arXiv:2403.10167. *Submitted*.
- *A combinatorial K -theory perspective on the edge reconstruction conjecture in graph theory*. Joint with J. J. Gould. 2023. 22 pages. Available at arXiv:2402.14986. To appear in *Homology, Homotopy, and Applications*.
- *Equivariant algebraic K -theory for symmetric monoidal Mackey functors*. Joint with D. Chan and M. Péroux. 2023. 20 pages. Available at arXiv:2312.04705. *Submitted*.
- *A linearization map for genuine equivariant algebraic K -theory*. Joint with D. Chan and A. Mejia. 2023. 33 pages. Available at arXiv:2309.08025. *Submitted*.
- *Equivariant Trees and Partition Complexes*. Joint with J.E. Bergner, P. Bonventre, D. Chan, and M. Sarazola. 2023. 31 pages. Available at arXiv:2302.08949. *Submitted*.
- *The Spectrum of the Burnside Tambara Functor of a Cyclic Group*. Joint with S. Ginnett. 2023. *Journal of Pure and Applied Algebra*: Vol. 227, Iss. 8, 107344. 23 pages.
- *The Tambara Structure of the Trace Ideal on Cyclic Groups*. Joint with S. Ginnett, with an appendix by H. Chen and X. Chen. 2020. *Journal of Algebra*: Vol. 560, pp.114–143.
- *Sharp Sectional Curvature Bounds and a New Proof of the Spectral Theorem*. Joint with C. Dunn. 2020. *Involve, a Journal of Mathematics*: Vol. 13, No. 3, pp.445–454.
- *k -Plane Constant Curvature Conditions*. 2019. *Rose-Hulman Undergraduate Mathematics Journal*: Vol. 20, Iss. 2, Article 6. 20 pages.

Other publications

- *Looking into Mirror Symmetry at the 2024 JMM*. In *Feature Stories of the American Mathematical Society*, February 2024.
- *Bringing Math into The Conversation: My Summer as a Mass Media Fellow*. In *Notices of the American Mathematical Society*, February 2024, pp.274–275.
- *A brief illustrated guide to ‘scissors congruence’ – an ancient geometric idea that’s still fueling cutting-edge mathematical research*. Co-authored with M. Merling. 2023. *The Conversation U.S.*
- *Proving Fermat’s last theorem: 2 mathematicians explain how building bridges within the discipline helped solve a centuries-old mystery*. Co-authored with D. Bressoud. 2023. *The Conversation U.S.*

FELLOWSHIPS AND AWARDS

Academic and research

- Herbert S. Wilf Memorial Award for excellence in research and communication
University of Pennsylvania, Mathematics Department 2023-2024
- Dean’s Scholar
University of Pennsylvania, School of Arts & Sciences 2023
- Graduate Research Fellowship
National Science Foundation 2020–2025
- Calabi Scholar
University of Pennsylvania, Mathematics Department 2020–2025
- Benjamin Franklin & Fontaine Fellowship
University of Pennsylvania 2020–2025
- Phi Beta Kappa
Reed College 2020
- Commendation for Academic Achievement
Reed College 2016-2020

Teaching and pedagogy

- Prison Teaching Initiative Graduate Fellow
Prison Teaching Initiative at Princeton University 2024-current
- CETLI Teaching Certificate
Center for Excellence in Teaching, Learning, and Innovation at the University of Pennsylvania 2024
- Master TA
University of Pennsylvania, Mathematics Department 2023-current
- Inclusive & Equitable Teaching Fellow
Center for Excellence in Teaching, Learning, and Innovation at the University of Pennsylvania 2023-2024
- Good Teaching Award, Math 3700
University of Pennsylvania, Mathematics Department Fall 2022

Service, communication, and outreach

- Postdoctoral/Advanced Graduate Ambassadorship
Lisa Simonyi and the Women and Mathematics Program at the Institute for Advanced Study 2023-2024
- Mass Media Fellow
American Association for the Advancement of Science
Sponsored by the American Mathematical Society and hosted by The Conversation U.S. 2023
- Penn Graduate Community-Engagement Research Fellow
The Netter Center at the University of Pennsylvania Summers 2021 and 2022
- Elevating Mathematics competition, honorable mention (joint with L. Williams)
National Academies of Sciences, Engineering, and Medicine 2020
- MAA MathFest Outstanding Presentation Award
Joint Mathematics Meetings 2019

TEACHING EXPERIENCE

The University of Pennsylvania	Philadelphia, PA
Teaching Assistant <i>Math 2600: Honors Calculus II</i>	Spring 2023
<i>Math 3700: Algebra</i>	Fall 2022
Workshop Facilitator <i>Inclusive & Equitable Teaching in Mathematics Mini-Course</i>	Fall 2023
<i>Mathematics Department TA Training</i>	Falls 2023 and 2024
<i>School of Arts & Sciences Graduate TA Training: Inclusive & Equitable Teaching at Penn</i>	Fall 2023
Prison Teaching Initiative at Princeton University	
Instructor at South Woods State Prison	Bridgeton, NJ
<i>Math-015: Beginning Mathematics</i>	Spring 2022 and Fall 2024
Instructor at Garden State Youth Correctional Facility	Crosswicks, NJ
<i>Math-015: Beginning Mathematics</i>	Fall 2021
Mathematics Tutor at South Woods State Prison	Bridgeton, NJ
<i>Math-010: Number Systems, Math-015: Beginning Mathematics,</i>	Spring 2023–Spring 2024
<i>Math-020: Elementary Algebra</i>	
Reed College	Portland, OR
Individual Tutor and Drop-in Tutor at the Math Help Center	Spring 2017–Spring 2020
<i>Math 111: Calculus, Math 112: Introduction to Analysis, Math 113: Discrete Structures,</i>	
<i>Math 201: Linear Algebra, Math 202: Vector Calculus, Math 311: Complex Analysis,</i>	
<i>Math 321: Real Analysis, and Math 332: Abstract Algebra</i>	
Course Assistant	Fall 2018–Spring 2020
<i>Math 202: Vector Calculus</i>	

OTHER EXPERIENCE AND SERVICE

Seminar and conference organization	
• Talbot Workshop	2023–2026
Talbot 2025: TBA, <i>co-organizer with A. Karapetyan and E. Sukarto</i>	
Talbot 2024: Topological cyclic homology of ring spectra, <i>co-organizer with A. Holeman, A. Karapetyan, L. Keenan, and E. Sukarto</i>	
Talbot 2023: Computations in stable motivic homotopy theory, <i>co-organizer with A. Holeman, L. Keenan, E. Sukarto, and L. Yang</i>	
• Atlantic Meeting on Topology, Representation theory, and K-theory (AMTRaK)	2024–current
<i>co-organizer with A. Chedalavada</i>	
• Gender Minorities in Topology and Related Areas Konfernce (GeMTRAK)	April 2024
at the University of Pennsylvania, <i>co-organizer with M. Ong and H. Stufflebeam</i>	
• Graduate Geometry/Topology Seminar at the University of Pennsylvania,	2022–2023
<i>co-organizer with A. Mejia</i>	
• Graduate Pizza Seminar at the University of Pennsylvania, <i>co-organizer with K. Canzius</i>	2021–2022
• UP GRADe workshop at the University of Pennsylvania, <i>co-organizer with</i>	October 2021
<i>A. Gibney, J. Hartmann, M. Merling, M. Ong, and E. Urheim</i>	
Community building and mentorship	
• Directed Reading Program at the University of Pennsylvania, <i>co-organizer with</i>	Fall 2023–current
<i>L. Ferreira Guilhoto and mentor for the following projects:</i>	
– Shotaro Hiranuma, <i>Category theory and logic</i>	Fall 2024
– Talia Becker Calazans, <i>Combinatorial topology</i>	Fall 2023
– Elena Isasi Theus, <i>Algebraic topology and the mathematical basis of topological data analysis</i>	Spring 2023
<i>Fundamentals of computational applied topology</i>	Fall 2022

- Cianán Conefrey-Shinozaki, *2D topological quantum field theories*
Spring 2022
- Michael Zeng, *Simplicial homotopy theory*
Fall 2021
- **Prison Education Program** at Eastern University, *volunteer*
Spring 2024
- **Prison Teaching Initiative** at Princeton University, *volunteer*
2021–current
- **GeMs in Math** group at the University of Pennsylvania, *co-coordinator*
2021–current
- **STEMGeMs** at Reed College, *co-leader and department liaison*
2019–2020
- **Peer Mentor Program** at Reed College, *mentor*
2017–2018

Science communication, outreach, and other service

- **PUMP Journal of Undergraduate Research**
Referee
Spring 2024
- **Math Circles** at West Philadelphia High School
Volunteer
Spring 2024
- **The Conversation U.S.**
Freelancer and AMS-AAAS 2023 Mass Media Fellow
Summer 2023-current
- **Math Circles in West Philadelphia** project at the University of Pennsylvania
Graduate fellow, joint project with M. Ong, mentored by M. Merling and Y. Ou
Summer 2022
Philadelphia, PA
- **Mathematics Enrichment and Academically-Based Community Service** project
at the University of Pennsylvania
Graduate fellow mentored by M. Merling
Summer 2021
Philadelphia, PA

SELECTED RESEARCH WORKSHOPS

- **SQuaREs Program** at American Institute of Mathematics
Team member for “An algebraic approach to Thom spectra”
January 2025
Pasadena, CA
- **AIM Workshop** at American Institute of Mathematics
Invited participant in “Scissors congruences, algebraic K-theory and Steinberg modules”
July 2024
Caltech, CA
- **SQuaREs Program** at American Institute of Mathematics
Team member for “Two-dimensional nested cobordisms and TQFTs with substructure”
February 2024
Pasadena, CA
- **Women in Topology IV** at the Hausdorff Institute
Team member for research project on cobordism categories
August 2023
Bonn (Germany)
- **RTG Collaborative Workshop in Homotopy Theory**
Team member for research project on equivariant homotopy theory
August 2022
Lexington, VA
- **Collaborative Mathematics Research Group** at Reed College
Participant in undergraduate research program on algebraic topology
Summer 2019
Portland, OR
- **NSF REU** program at California State University, San Bernardino
Participant in undergraduate research program on differential geometry
Summer 2018
San Bernardino, CA

SELECTED TALKS AND PRESENTATIONS

Research conference Talks

- AMS 2024 Fall Eastern Sectional Meeting, Special Session: Homotopy theory and K -theory
Squares K -theory and 2-Segal spaces
October 2024
Albany, NY
- Graduate Student Conference in Algebra, Geometry, and Topology
Equivariant Trees and Partition Complexes
June 2024
Philadelphia, PA
- Joint Mathematics Meetings, Special Session: Equivariant techniques in stable homotopy theory
A linearization map for equivariant A -theory
January 2024
San Francisco, CA
- Joint Mathematics Meetings, Special Session: Topics in equivariant algebra
Ideals in the Burnside Tambara functor on a cyclic group
January 2024
San Francisco, CA
- Binghamton University Graduate Combinatorics, Algebra, and Topology Conference (BUGCAT)
Equivariant Partition Complexes and Trees
November 2022
Binghamton, NY
- Nebraska Conference for Undergraduate Women in Mathematics
The Tambara Structure of the Trace Ideal
January 2020
Lincoln, NE
- Undergraduate Mathematics Symposium
Putting the ‘ k ’ in Curvature: k -Plane Constant Curvature Conditions
November 2018
Chicago, IL

Northwest Undergraduate Mathematics Symposium
Putting the 'k' in Curvature: k-Plane Constant Curvature Conditions

November 2018
Salem, OR

Invited Seminar Talks

University of Virginia Topology Seminar
Towards A-theory of orbifolds

Johns Hopkins University Topology Seminar
Towards A-theory of orbifolds

Texas State Topology Seminar
A linearization map for equivariant A-theory

University of Indiana Bloomington Topology Seminar
Nested Cobordisms and TQFTs

University of Minnesota Topology Seminar
All connective G-spectra come from K-theory

Loyola University TACO Seminar
Equivariant Partition Complexes and Trees

Michigan State University RTG Seminar
Nested Cobordisms and TQFTs

SUNY Binghamton Geometry and Topology Seminar
Nested Cobordisms and TQFTs

UCLA Algebraic Topology Seminar
Equivariant Partition Complexes and Trees

UCSD Topology Seminar
Equivariant Partition Complexes and Trees

Purdue University Topology Seminar
Equivariant Partition Complexes and Trees

University of Rochester Topology Seminar
Equivariant Partition Complexes and Trees

University of Virginia Topology Seminar
Equivariant Partition Complexes and Trees

November 2023
Charlottesville, VA

October 2023
Baltimore, MD

March 2024
San Marcos, TX

March 2024
Bloomington, IN

January 2024
Minnesota, MN

November 2023
Chicago, IL

November 2023
East Lansing, MI

September 2023
Binghamton, NY

May 2023
Los Angeles, CA

May 2023
San Diego, CA

April 2023
Lafayette, IN

April 2023
Rochester, NY

February 2023
Charlottesville, VA

Invited Expository Talks

SLMath Hot Topics Workshop: Life after the Telescope Conjecture
Cyclotomic spectra

Talbot 2024: Topological cyclic homology of ring spectra
THH as a cyclotomic spectrum

Scissors congruences, algebraic K-theory and Steinberg modules AIM Workshop
The scissors congruence K-theory of polytopes is a Thom spectrum

Spaces of Manifolds: Algebraic and Geometric Approaches BIRS seminar
The stable parametrized h-cobordism theorem: the K-theory part

Scissors Congruence, Algebraic K-Theory, and Trace Methods summer school
Cut-and-paste K-theory of manifolds and square K-theory

Talbot 2022: Scissors congruence and algebraic K-theory
Square K-theory and Manifold Invariants

Berkeley, CA
December 2024

Nacogdoches, TX
August 2024

Pasadena, CA
July 2024

online
October 2023

Bloomington, IN
June 2023

New Lebanon, NY
June 2022

Talks for Undergraduates

Reed College Mathematics Colloquium
The Edge Reconstruction Conjecture and Combinatorial K-theory

Providence College Mathematics Colloquium
The Edge Reconstruction Conjecture and Combinatorial K-theory

Penn Undergraduate Mathematics Society (PUMS) speaker series
Social choice problems and algebraic topology (short talk)
Configurations in the plane (short talk)
Scissors Congruence: how to cut up shapes and get away with it

Temple University Math Club
Scissors Congruence: how to cut up shapes and get away with it

Portland, OR
October 2024

Providence, RI
September 2024

Philadelphia, PA
April 2024

November 2023

December 2022

Philadelphia, PA
March 2024