

Bena Tshishiku

Assistant Professor
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Employment

7/2024- present, Brown University, Joukowsky Family Assistant Professor.
7/2019- 7/2024, Brown University, Assistant Professor.
7/2016- 6/2019, Harvard University, Benjamin Peirce Fellow.
8/2015- 6/2016, Stanford University, NSF Postdoctoral Fellow.

Education

Ph.D. Mathematics, University of Chicago, 2015. Advisor: Benson Farb.
Thesis: *Obstructions to realizing mapping classes by diffeomorphisms*
B.S. Mathematics, Washington and Lee University, 2010. Summa Cum Laude, Phi Beta Kappa.

Current and completed grants

2023-2028 NSF CAREER grant DMS-2236705, sole PI, \$549,595
2021-2025 NSF grant DMS-2104346, sole PI, \$322,138
2015-2018 NSF Postdoctoral Fellow
2011-2015 NSF Graduate Student Research Fellowship

Fields of interest

Geometric topology: group actions, manifolds, fiber bundles; diffeomorphism groups, mapping class groups, arithmetic groups

Publications

Accepted and published papers

18. Mapping class groups of exotic tori and actions by $SL(d, \mathbb{Z})$ (with M. Bustamante, M. Krannich, S. Kupers).
Trans. Amer. Math. Soc. to appear.

17. Mapping class groups of circle bundles over a surface (with L. Chen)
Michigan Math J. to appear.
16. Convex-compact subgroups of the Goeritz group.
Trans. Amer. Math. Soc. to appear.
15. Nielsen realization for sphere twists of 3-manifolds (with L. Chen).
Israel J. Math. to appear.
14. Symmetries of exotic negatively curved manifolds (with M. Bustamante),
J. Differential Geom. 120 (2022) 2, 231-250.
13. Arithmeticity of groups $\mathbb{Z}^n \rtimes \mathbb{Z}$,
Indiana Univ. Math. J. 71 (2022) 4, 1797-1818.
12. Finite rigid sets and the separating curve complex (with J. Huang¹).
Topol. Appl. 312 (2022).
11. Geometric cycles and characteristic classes of manifold bundles (with appendix by M. Krannich).
Comment. Math. Helv. 96 (2021) 1, 1-45.
10. Characteristic classes of bundles of K3 manifolds and the Nielsen realization problem (with J. Gian-siracusa, A. Kupers),
Tunis. J. Math. 3 (2021) 1, 75-92.
9. Arithmeticity of the monodromy of some Kodaira fibrations (with N. Salter),
Compos. Math. 156 (2020) 1, 114-157.
8. Groups with Bowditch boundary a 2-sphere (with G. Walsh),
Groups Geom. Dyn. 14 (2020), no. 3, 791-811.
7. Borel's stable range for the cohomology of arithmetic groups,
J. Lie Theory 29 (2019) 4, 1093-1102.
6. Realization problems for diffeomorphism groups (with K. Mann),
Proc. Sympos. Pure Math. 102 (2019), 131-156.
5. Hyperbolic groups with boundary an n-dimensional Sierpinski space (with J. Lafont),
J. Topol. Anal. 11 (2019) 1, 233-247.
4. Characteristic classes of fiberwise branched covers via arithmetic groups,
Michigan Math. J. 67 (2018), 31-58.
3. On the non-realizability of braid groups by diffeomorphisms (with N. Salter),
Bull. Lond. Math. Soc. 48 (2016) 3, 457-471.
2. Pontryagin classes of locally symmetric manifolds,
Algebr. Geom. Topol. 15 (2015) 5, 2709-2756.
1. Cohomological obstructions to Nielsen realization,
J. Topol. 8 (2015) 2, 352-376.

¹undergraduate

Submitted papers

2. Surface mapping class group actions on 3-manifolds (with A. al Beaini², L. Chen).
arxiv:2311.15508
1. Symmetries of exotic smoothings of aspherical space forms (with M. Bustamante).
arxiv:2109.09196

Other articles

2. Advice from our advisor: Benson Farb, **Notices of AMS**, Nov 2021.
1. Surface bundles in topology, algebraic geometry, and group theory, **Notices of AMS**, Feb 2020.

Invited Talks

Conference talks

2024

Ceresa cycle in arithmetic and geometry. ICERM
Spring topology and dynamics conference. Charlotte

2023

Texas Geometry and Topology Conference. Rice
Groups around 3-manifolds. CRM (Montreal)
Interactions between algebraic topology and geometric group theory. Oaxaca
Mid-Atlantic topology conference. UPenn

2022

Low-dimensional topology and homeomorphism groups. Maryland

2021

Cohomology of Arithmetic Groups: Duality, Stability, and Computations. Banff
Spring Topology and Dynamics Conference

2020

Georgia Tech Topology Conference

2019

Cascade topology conference. U Manitoba
4-manifolds: confluence of high/low dimensions. Fields Institute
Redbud topology conference. U Oklahoma
Spring Topology and Dynamics Conference. U Alabama-Birmingham

²PhD student

2018

AMS Sectional, Special Session on Low-dimensional Topology and Dynamics (Fayetteville, AR)
 William Rowan Hamilton geometry and topology workshop. Trinity College-Dublin
 Summer conference on topology and applications. Bowling Green, KY
 Glances@Manifolds. Krakow
 Manifolds, groups, and homotopy. Skye, Scotland
 AMS Sectional, Session on Boundaries and nonpositive curvature in group theory. Vanderbilt
 AMS Sectional, Session on Symmetry in differential geometry. Ohio State
 Structure of 3-manifold groups. CIRM
 JMM Special session on boundaries for groups and spaces. San Diego

2017

Canadian Math Society winter meeting. Waterloo
 Math Congress of the Americas. Montreal
 Cohomology of arithmetic groups masterclass. U Copenhagen
 Geometric groups on the gulf coast (G^3) conference. Pensacola
 Spring topology and dynamics conference. Jersey City

2016

Surface bundles. Oberwolfach
 Surgery and geometry workshop. Banff
 Workshop on group actions. Fields Institute
 Cornell topology festival

2014

Wasatch topology conference. Park City

Colloquia

2023: SUNY-Buffalo, Holy Cross
 2022: PUC-Chile, Temple
 2021: Rice, Wesleyan, UW-Milwaukee
 2020: Duke, Georgia Tech

Seminar talks

2024: Tufts, Wesleyan
 2023: SUNY-Buffalo, Purdue, Vanderbilt
 2022: UChicago, PUC-Chile, Yale, Temple, MIT, Boston College
 2021: Michigan, UC-Riverside, CUNY, Tufts, Northeastern

2020: Caltech, Tufts, U-Penn, Binghamton

2019: UCSD, Tufts, Michigan, Ohio State

2018: Irvine, MIT, Temple, UMass-Amherst, SUNY-Albany, Columbia, UVa, Minnesota, UIC, Rutgers, Madison, Brown

2017: MIT, Boston College, Madison, Notre Dame, Northwestern, Brandeis, Northeastern, Brown

2016: Purdue, Tufts, Binghamton, Boston U

2015: LMU Munich, Northwestern, Indiana, Stanford, Berkeley, Rice, Ohio State, Purdue

Teaching and advising

Graduate mentoring

2021-2025: Trent Lucas, PhD

2020-2024: Alina Al Beaini, PhD

2019-2021: Tom Stone, MS

Dissertation committees

2024: Sam Freedman, Zhenghao Rao

Topic exam committees

2023: Megan Chang-Lee

2021: Zhenghao Rao, Li Feng

2020: Sam Freedman

Undergraduate mentoring

Summer 2023: Jonah Mendel, reading: *Bounded generation for arithmetic groups*

Fall 2022: Alex Feiner, reading course (Math 1970): *Sheaves*

Summer 2021: Junzhi Huang, research project: *Rigidity properties of curve complexes*

Summer 2020: Alex Bauman, research project: *Section problems for graph configuration spaces*

Summer 2020: Dominick Joo, research project: *Finite-order surface homeomorphisms*

Fall 2019: Eli Fonseca, reading course (Math 1970): *Bott periodicity*

Courses taught

Spring 2024: Math 242, Algebraic topology II (graduate), 9 students
 Fall 2023: Math 106, Differential geometry (undergraduate), 24 students
 Spring 2023: Math 123, Graph theory (undergraduate), 68 students
 Spring 2022: Math 272, Signatures in topology (graduate) 8 students
 Fall 2021: Math 126, Complex analysis (undergraduate), 34 students
 Spring 2021: Math 123, Graph theory (undergraduate), 33 students
 Fall 2020: Math 141, Topology (undergraduate), 27 students
 Spring 2020: Math 242, Algebraic topology II (graduate), 10 students
 Fall 2019: Math 2410, Algebraic topology I (graduate), 10 students

Awards

2022. Philip J. Bray Award for Excellence in Teaching in the Physical Sciences

*Service**Service to the department*

Spring 2021-present: Co-director of undergraduate studies (with C. Breiner, R. Schwartz, I. Vogt)
 Fall 2021-present: Geom-Top seminar co-organizer (with R. Schwartz)
 2019, 2020: Graduate admissions

Service to the community

Brown Math Circle: weekly math enrichment at local middle and high schools
 2019-2021: Blackstone Valley Prep Middle School
 2021-present: Achievement First High School

Service to the profession

1. Conferences organized

Spring 2025: STDC session on geometric topology. Newport News
 co-organizer: C. Rovi
 Spring 2024: GATSBY Conference at Yale
 co-organizers: F. Vargas-Pallete, S. Dey, T. Cheetham-West, S. Freedman
 Fall 2023: GATSBY Conference at Brown
 co-organizers: F. Vargas-Pallete, S. Dey
 Spring 2023: GATSBY Conference at Yale
 co-organizer: F. Vargas-Pallete

Fall 2022: GATSBY Conference at Brown

co-organizer: F. Vargas-Pallete

Spring 2022: STDC session on geometric topology. Baylor

co-organizer: F. Manin

Spring 2019: STDC session on geometric topology. Birmingham

co-organizers: G. Friedman, C. Guillbault

2. Reviewer

2022, 2023: NSF Panelist

2016-present: Peer review for G&T, Forum Math Pi, Compositio, JDG, JTop, PAMS, BLMS, Commentarii, JAMS, QJM, Michigan MJ, Israel JM, AGT, JTA, Nagoya MJ, GD

2020- present: Mathscinet reviewer (23 written reviews)

3. Directed reading program (grad/undergrad math mentoring program)

2024: Brown Summer DRP organizer; 6 undergrad students, 4 grad student mentors

2017-2021: DRP Network. A faculty oversight team for national, NSF-funded network of directed reading programs, providing resources and tools for program startup and best-practices and NSF-funded study of efficacy and outcomes.

2012-2015: UChicago DRP organizer and mentor

Last updated: August 17, 2024