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.

B.S. Mathematics, Washington and Lee University, 2010. Summa Cum Laude, Phi Beta Kappa.

Grants

NSF CAREER grant DMS-2236705 (2023-2028)

NSF grant DMS-2104346 (2021-2025)

NSF Postdoctoral Fellow (2015 – 2018)

NSF Graduate Student Research Fellowship (2011 – 2015)

Fields of Interest

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

Publications

Accepted and published papers

18. Mapping class groups of exotic tori and actions by $\mathrm{SL}(d,\mathbb{Z})$ (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. Nielsen realization for sphere twists of 3-manifolds (with L. Chen). **Israel J. Math.** to appear.

15. Convex-compact subgroups of the Goeritz group. **Trans. Amer. Math. Soc.** 377 (2024), no. 1, 271-322.
14. Finite rigid sets and the separating curve complex (with J. Huang). **Topol. Appl.** 312 (2022).
13. Arithmeticity of groups $\mathbb{Z}^n \rtimes_A \mathbb{Z}$, **Indiana Univ. Math. J.** 71 (2022) 4, 1797-1818.
12. Symmetries of exotic negatively curved manifolds (with M. Bustamante), **J. Differential Geom.** 120 (2022) 2, 231-250.
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. Giansiracusa, A. Kupers), **Tunis. J. Math.** 3 (2021) 1, 75-92.
9. Groups with Bowditch boundary a 2-sphere (with G. Walsh), **Groups Geom. Dyn.** 14 (2020), no. 3, 791-811.
8. Arithmeticity of the monodromy of some Kodaira fibrations (with N. Salter), **Compos. Math.** 156 (2020) 1, 114-157.
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.

Submitted papers

2. Surface mapping class group actions on 3-manifolds (with A. al Beaini, 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

Ceresa cycle in arithmetic and geometry. ICERM 2024

Spring topology and dynamics conference. Charlotte 2024

Texas Geometry and Topology Conference. Rice 2023

Groups around 3-manifolds. CRM (Montreal) 2023

Interactions between algebraic topology and geometric group theory. Oaxaca 2023

Mid-Atlantic topology conference. UPenn 2023

Low-dimensional topology and homeomorphism groups. Maryland 2022

Cohomology of Arithmetic Groups: Duality, Stability, and Computations. Banff 2021

Spring Topology and Dynamics Conference 2021

Georgia Tech Topology Conference 2020

Cascade topology conference. U Manitoba 2019

4-manifolds: confluence of high/low dimensions. Fields Institute 2019

Redbud topology conference. U Oklahoma 2019

William Rowan Hamilton geometry and topology workshop. Trinity College-Dublin 2018

Structure of 3-manifold groups. CIRM 2018

Cohomology of arithmetic groups masterclass. U Copenhagen 2017

Geometric groups on the gulf coast (G^3) conference. Pensacola 2017

Surface bundles. Oberwolfach 2016

Surgery and geometry workshop. Banff 2016

Cornell topology festival 2016

Wasatch topology conference. Park City 2014

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

Ph.D. mentoring

Trent Lucas, PhD, May 2025 (expected)

Alina Al Beaini, PhD, Dec. 2024 (expected)

Tom Stone, MS, May 2021

Undergraduate mentoring

Jonah Mendel, summer reading (bounded generation for arithmetic groups), 2023

Junzhi Huang, summer research (rigidity properties of curve complexes), 2021

Alex Bauman, summer research (graph configuration spaces), 2020

Dominick Joo, summer research (finite-order surface homeomorphisms), 2020

Eli Fonseca, reading course (Bott periodicity), 2019

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

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

Service

Service to the department

Co-director of undergraduate studies, Spring 2021-present

Geom-Top seminar co-organizer, Fall 2021-present

Graduate admissions 2019, 2020

Service to the community

Brown Math Circle: weekly math enrichment at local middle and high schools, Fall 2019-present.

Service to the profession

1. Conferences organized

   Brown-Yale Geom-Top Conference (GATSBY); Fall 2022, Spring 2023, Fall 2023, Spring 2024
   Spring Topology and Dynamics Conference; Spring 2019, Spring 2022, Spring 2025

2. Refereeing

Geom. Topol.	Forum Math. Pi.	Compos. Math.	J. Diff. Geom.
J. Topol.	Proc. Amer. Math. Soc.	Bull. Lond. Math. Soc.	Comm. Math. Helv.
J. Lond. Math. Soc.	Quart. J. Math.	Michigan Math. J.	Israel J. Math.
Alg. Geom. Topol.	J. Topol. Anal.	Nagoya Math. J.	Geom. Dedicata

3. NSF Panelist 2022, 2023

4. DRP Network: on faculty oversight team for national, NSF-funded network of directed reading programs (grad–undergrad math mentorship), providing resources and tools for program startup and best-practices and NSF-funded study of efficacy and outcomes, 2017-2021.