LAURA MURRAY

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RESEARCH INTERESTS

Algebraic Topology, Topological Quantum Field Theories, Higher Category Theory, String Structures, Factorization Algebras

EMPLOYMENT

Providence College January 2021-present
Assistant Professor of Mathematics

EDUCATION

University of Notre Dame
Ph.D. in Mathematics May 2020
Advisor: Stephan Stolz. Thesis: Equivariant factorization algebras: an ∞-operadic approach

M.S. in Mathematics May 2016

Providence College
B.A., Mathematics and Humanities, double major, Summa cum laude, 4.0 GPA May 2014
Valedictorian

GRANTS

National Science Foundation: Launching Early-Career Academic Pathways 2023-2025
Project Title: Quantum Field Theories and Elliptic Cohomology
PI, within the Mathematical and Physical Sciences program; total funds awarded: $130,532

National Science Foundation: Conference Grant 2023-2025
Project Title: New England Algebraic Topology and Mathematical Physics Seminar
Co-PI and co-organizer of bi-annual conference series; total funds awarded: $38,000

SPaRC Interdisciplinary Grant, Providence College 2021-2022
Project Title: Topological Data Analysis and Interdisciplinary Network Science
Mentor for undergraduate research project; total funds awarded: $4,425

PUBLICATIONS (Blind Peer-Reviewed)

Nested cobordims, Cyl-objects and Temperley-Lieb algebras (with M. Calle, R. Hoekzema, N. Pacheco-Tallaj, C. Rovi, S. Sridhar-Shapiro), Topology and its Applications (2025, accepted).

Flat principal 2-group bundles and flat string structures (with D. Berwick-Evans, E. Cliff, A. Nakade, E. Phillips), Contemporary Mathematics, Quantum Symmetries: Tensor Categories, TQFTs, and Vertex Algebras, Vol. 813, pages 257-301, 2025.

Cut and paste invariants via algebraic K-theory (with R. Hoekzema, M. Merling, C. Rovi and J. Semikina), Topology and its Applications, Vol. 316, pages 108105, 2022.

Homological perspective on edge modes in linear Yang-Mills and Chern-Simons theory (with P. Mathieu, A. Schenkel and N. Teh), Letters in Mathematical Physics, Vol. 110, pages 1559–1584, 2020.

Why surplus structure is not superfluous (with N. Teh and J. Nguyen), British Journal for the Philosophy of Science, Vol. 71, No. 2, pages 665–695, 2020.

IN PREPARATION

The Freed-Quinn line bundle in terms of group cohomology (with D. Berwick-Evans and E. Cliff).

Equivariant and geometrical factorization algebras.

BOOK REVIEW

One hundred years of general relativity (with K. Brading and S. Murgueitio Ramirez), Metascience, January 2017, book review.

INVITED TALKS

University of Notre Dame, Field Theory and Topology Conference, Notre Dame, IN
Talk: Principal 2-group bundles and the Freed-Quinn line bundle June 2024

University of Sherbrooke, Mathematics Seminar, Sherbrooke, Canada November 2023
Talk: 2-group principal bundles and string structures

UMass-Amherst, Representation Theory Seminar, Amherst, MA April 2022
Talk: Equivariant factorization algebras and higher categories

UC-Santa Barbara, Quantum Algebra and Topology Seminar April 2021
Talk: Moduli of principal bundles for 2-groups *(virtual)*

Joint Mathematics Meeting, Denver, CO January 2020
Special session on Geometric Representation Theory & Equivariant Elliptic Cohomology
Talk: 2-groups and line bundles over the moduli space of elliptic curves

Special session on Categorical and Computational Methods in Homotopy Theory
Talk: Higher categories and factorization algebras

University of Virginia, Topology Seminar, Charlottesville, VA October 2019
Talk: Factorization algebras and higher categories

UIUC, Topology Seminar, Urbana-Champaign, IL February 2019
Talk: Equivariant factorization algebras

Kalamazoo College, Mathematics Department Colloquium, Kalamazoo, MI October 2018
Talk: Knot theory, polynomials and physics

The Fields Institute, Séminaire de mathématiques superérieures, Toronto, Canada
Derived Geometry & Higher Categorical Structures in Geometry and Physics June 2018
Junior research talk:Comparing G-equivariant factorization algebras to $\mathcal{G}$-factorization algebras

9th European Congress of Analytic Philosophy, LMU, Munich, Germany August 2017
Ludwig Maximilian University, Munich
Talk: Why Surplus Structure is not Superfluous

Women in Science Series, Indiana University–South Bend, IN April 2016
Talk: Algebraic topology and quantum field theories

RESEARCH ACTIVITY & PRESENTATIONS

American Inst. of Mathematics SQuaREs program, Pasadena, CA 2024-2026
Lead organizer; fellowhsip hosted at AIM in Caltech for collaborative project with M. Calle, R. Hoekzema, N. Pacheco-Tallaj, C. Rovi, S. Sridhar-Shapiro

Women in Topology IV Workshop, Hausdorff Institute, Bonn, Germany August 2023
Mentor (with R. Hoekzema, C. Rovi) for collaborative project on nested cobordisms
Junior team participants: M. Calle, N. Pacheco-Tallaj, S. Sridhar

Equivariant Bordism Theory and Applications, CMO, Oaxaca, Mexico June 2023
Casa Matemática Oaxaca
Invited workshop participant

Summer Research for Women in Mathematics, MSRI, Berkeley, CA Summer 2020
Mathematical Sciences Research Institute (postponed to 2021,
Collaboration project with R. Hoekzema, M. Merling, C. Rovi and J. Semikina *moved to virtual)*

Higher Categories & Categorification, MSRI, Berkeley, CA January 2020
Connections for Women, Mathematical Sciences Research Institute
Teaching assistant for introductory program, facilitated problem sessions

Women in Topology III Workshop, Hausdorff Institute, Bonn, Germany August 2019
Junior participant; collaborative project on cut and paste invariants of manifolds
Joint with with R. Hoekzema, M. Merling, C. Rovi and J. Semikina

MathFest, Mathematical Association of America, Cincinnati, OH July 2019
Panel presentation: Graduate School in Mathematics–What's it like, and how do you get in?

Higher Structures, CIRM, Luminy, France January 2019
Centre International de Rencontres Mathématiques
Talk: Equivariant factorization algebras

University of Notre Dame, Topology Seminar, Notre Dame, IN September 2018
Talk: G-equivariant factorization algebras

Higher algebras and mathematical physics, Perimeter Institute, Waterloo, Canada
Talk: G-equivariant factorization algebras August 2018

Talbot Workshop, Government Camp, OR May 2018
Graduate student workshop on a model-independent theory of ∞-categories
Talk: Arrow and comma ∞-categories

Graduate Student Topology Seminar, University of Notre Dame Spring 2018
Minicourse: Topological Quantum Field Theories

Women in Topology Workshop, MSRI, Berkeley, CA November 2017
Mathematical Sciences Research Institute
Talk: Factorization Algebras and Field Theories

Algebraic Topology of Manifolds School, University of Oxford, Oxford, UK
London Mathematical Society-Clay Mathematics Institute September 2017
Graduate student research school, participant talk: Factorization Algebras and Field Theories

Bridge Program, University of Notre Dame August 2017
Talk: Vector Bundles and Tangent Bundles

StringMath, Center for Mathematical Physics, Hamburg, Germany July 2017
Pre-StringMath Summer School and StringMath Conference

History and Philosophy of Science Workshop, University of Notre Dame March 2017
Talk: Surplus Structure in Gauge Theories

Center of Ethics and Culture Fall Conference, University of Notre Dame November 2016
Talk: Mathematics and Beauty: Its Role in a Liberal Arts Education

Bridge Program, University of Notre Dame August 2016
Talk: An Introduction to Manifolds

European Talbot Workshop, Winterberg, Germany June 2016
Graduate student workshop on topological quantum field theories
Talk: (1,2)-TFT's and Frobenius Algebras

Philosophy of Physics Workshop, University of Notre Dame April 2016
Talk: Kapustin's Rigidity Theorem for Quantum Mechanics

Summer Graduate School, MSRI, Berkeley, CA June 2015
Mathematical Sciences Research Institute
Graduate student workshop on geometric group theory

HONORS & AWARDS

Leaders in Inclusive Teaching at Providence College 2024
Pedagogy innovation program

Project NExT Fellow, Mathematical Association of America 2021-2022
New Experiences in Teaching, national teaching development program

Outstanding Graduate Student Teaching Award, University of Notre Dame 2018

Striving for Excellence in Teaching Certificate, University of Notre Dame 2017
Kaneb Center for Teaching Excellence

Schmitt Fellowship, University of Notre Dame 2016-2019

TEACHING EXPERIENCE

Providence College	MTH 395: Research in Topology	Spring 2025
	MTH 223: Calculus & Analytical Geometry III	Sp 2022-Sp 2024
	MTH 110: Calculus II	Spring 2021, Fall 2021
	MTH 108: Business Analysis II	Sp 2021-Sp 2025
University of Notre Dame	Online College Teaching Series, Moderator, Kaneb Center	Fall 2019
	Glynn Honors Mathematics Seminar: Knots and Surfaces (TA)	Spring 2019
	Geometry and Topology Undergraduate Summer Workshop, Graduate Mentor	Summer 2018
	Principles of Finite Mathematics (Instructor of Record)	Spring 2018
	Calculus A (Instructor of Record)	Fall 2016
	Calculus II (TA)	Spring 2016
	Calculus I (TA)	Fall 2015

UNDERGRADUATE RESEARCH PROJECTS

Skeletal 2-groups and category theory, Providence College Spring 2024
Mentor of NSF-funded undergraduate research project
Students presented at 15th Annual Celebration of Student Scholarship and Creativity

Topological Data Analysis and Ant Networks, Providence College Spring 2022
Mentor of undergraduate research project
Students presented at 13th Annual Celebration of Student Scholarship and Creativity

Honors undergraduate reading project, University of Notre Dame 2016-2017
Mentor on reading project on knot theory

Talliaferro competition, University of Notre Dame Summer 2016
Mentor, undergraduate independent research project

SERVICE TO DEPARTMENT

Pi Mu Epsilon Faculty Co-Advisor Fall 2022-present
Co-advisor for mathematics honors society; co-organizer for Honors Induction Ceremony

Mathematics & Computer Science Department Colloquium Fall 2022-present
Co-Organizer

William Lowell Putnam Mathematical Competition Fall 2022-Spring 2024
Faculty Supervisor
National annual mathematics competition for undergraduate students

Advisor for mathematics majors

Placement test scoring for incoming first year students Summer 2021, 2022

Departmental Orientation Day Summer 2021, 2022
Volunteer, spoke with students and parents

Graduate School in Mathematics Panel Sp 2021, 2023
Organizer/facilitator, Mathematics & Computer Science Department

Early Admitted Students Day, volunteer Spring 2021, 2022, 2025

SERVICE TO PROVIDENCE COLLEGE

Emerging Technologies Center Advisory Committee Spring 2025
Member

Faculty & Staff Philanthropy Committee Fall 2025-present
Member

Development of Western Civilization at Providence College Committee Fall 2025-present
Member; elected by DWC faculty

Academic Convocation Speaker Committee Spring 2023-present
Member; made initial contact and invitation to Dr. Andrew Delbanco, Fall 2023 speaker

Randall Distinguished Chair Committee Fall 2023-present
Member; nominated Dr. Mia Chung, scheduled as 2026-27 Randall Chair

Neuroscience Advisory Board Fall 2022-Fall 2023
Member; advisor for neuroscience majors

Liberal Arts Honors Program, Early Admitted Students Day Spring 2023, 2024
Presented mock lecture for admitted students; spoke with parents

Gradescope Faculty Panel June 2021
Panelist, Instructional Technology Development Program

Liberal Arts Honors Program Alumni Panel April 2021
Panelist, program for admitted students

SERVICE TO DISCIPLINE

Reviewer for the Dutch Research Council (NWO) 2025
Reviewer for grant proposal

Reviewer for *Progress in Mathematical Physics*, Springer 2024
Reviewer for book proposal

Women In Topology IV, Mentor Summer 2023-present
Mentor for research team of graduate students and post-docs

New England Algebraic Topology & Mathematical Physics Seminar 2023-present
Co-PI for NSF-funded conference series; bi-annual conferences have been held at Northeastern University, Boston University and Amherst College, Providence College

Dissertation committee member for Dr. Emma Philips July 2022
University of New Hampshire

Undergraduate Student Paper Presentation Judge, MAA MathFest August 2021
Judge for student research presentations

PROFESSIONAL ORGANIZATIONS

American Mathematical Society (AMS), Association for Women in Mathematics (AWM), Mathematical Association of America (MAA)