Jeffrey D. Carlson

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Positions

Imperial College London (2021–2022)

Postdoctoral fellowship

Fields Institute (Spring 2020)
Western University (Fall 2019)

Joint postdoctoral fellowship

University of Toronto (2016–2019)

Postdoctoral fellowship

Universidade de São Paulo (2015–2016)

Pós-Doutorado de Excelência,
funded through **IMPA** (o Instituto Nacional de Matemática Pura e Aplicada)
and **CAPES** (a Coordenação de Aperfeiçoamento de Pessoal de Nível Superior)

Education

Tufts University

Ph.D. in Mathematics (2015)
Advisor: Loring Tu
Dissertation: *On the equivariant cohomology of homogeneous spaces*

Citizenship

United States

Interests

Equivariant topology: cobordism, K-theory, and Borel cohomology

Topology and geometry of actions on manifolds

Symplectic topology

A_∞-algebras

Galois cohomology

Low-dimensional topology and surface dynamics

Book

The Rational Cohomology of Homogeneous Spaces (2022 (projected),
under revision by request of Springer's *Developments in Mathematics* series)).
dropbox.com/s/dz1fbsfokn6z6n3/homogeneous_space_book.pdf

Preprints

1. Products on Tor (2021, 77pp.).
   u.pcloud.link/publink/show?code=XZeFuCXZDkaRDIJg9SS37hF43n3sRQP6bs07
2. The cohomology the Gelfand–Zetilin fiber (with Jeremy Lane, 2021, 30pp.).
   arxiv.org/abs/2107.02721
3. A product on the two-sided bar construction and the cohomology of biquotients
   (with an appendix joint with Matthias Franz, 2020, 41pp.).
   arxiv.org/abs/2106.02986
4. Fixed points and semifree bordism (2019, 13pp.).
   u.pcloud.link/publink/show?code=XZq8CqXZwbHEpPusnQjfVk5kO90LqVObYiEk
5. Equivariant formality of isotropy actions of corank one (with Chen He, 2018–).
6. The K-theory of cohomogeneity-one actions (2018, 40pp.).
   u.pcloud.link/publink/show?code=XZOQCqXZs4sfg5z3BVhjhUUkpCkmwjP10gGV
7. Realization of abstract GKM isotropy data
   (with Elisheva Adina Gamse and Yael Karshon, 2016–).
   math.toronto.edu/jcarlson/realization.pdf

8. K-theory and formality (2016, 32pp.).
   u.pcloud.link/publink/show?code=XZSQCqXZSAJd075qdC4QXr5l38C4mFzVrLbX
9. Commensurability of two-multitwist pseudo-Anosovs (2010, 33pp.).
   arxiv.org/abs/1011.0247

Publications

1. The equivariant cohomology ring of a cohomogeneity-one action
   (with Chen He, Oliver Goertsches, and Liviu Mare, 2018),
   Geometriae Dedicata (2019, 18pp.).
   arxiv.org/abs/1802.02304
2. Grassmannians and the equivariant cohomology of isotropy actions (2016),
   Proceedings of the American Mathematical Society (2021, 15pp.).
   arxiv.org/abs/1611.01175
3. The K-theory of the conjugation action (2016),
   Comptes Rendus Mathématique de l'Académie des Sciences, Paris (2021, 2pp.)
4. Equivariant formality of homogeneous spaces (with Chi-Kwong Fok, 2017),
   Journal of the London Mathematical Society (2018, 23pp.).
   arxiv.org/abs/1511.06228
5. Equivariant formality of isotropic torus actions (2014),
   Journal of Homotopy and Related Structures (2018, 34pp.).
   arxiv.org/abs/1410.5740
6. Conceptions of topological transitivity (with Ethan Akin, 2010),
   Topology and its Applications **159** (2012), pp. 2815–2830.
   arxiv.org/abs/1108.4710

Selected conference talks

Multiplicative collapse in the Eilenberg–Moore spectral sequence,
Transpennine Topology Triangle (Dec. 2020, invited)

The cohomology of Gelfand–Zeitlin fibers,
International Conference: Topology and Geometry of Group Actions (Nov. 2020, invited)

Local integration in equivariant cobordism theory, "Topology" session,
The equivariant K-theory of a cohomogeneity-one action, "Equivariant methods in differential and algebraic geometry" session,
Canadian Mathematical Society Summer Meeting, Regina (June 2019, invited)

Realization of fixed-point data for locally standard torus actions,
Glances@Manifolds, Jagiellonian University, Kraków (July 2018)

The equivariant cohomology and K-theory of a cohomogeneity-one action,
Algebraic Topology, Combinatorics, and Mathematical Physics, on the occasion of Victor Buchstaber's 75th birthday, Steklov Institute and Skolkovo Technical Institute, Moscow (May 2018, invited)

Rational equivariant K-theory of homogeneous spaces,
Homotopy theory: Tools and Applications, Univerity of Illinois, Urbana-Champaign (July 2017)

Equivariant formality beyond Hamiltonian actions,
Mathematical Congress of the Americas, Montreal (July 2017, invited)

Equivariant formality and formality for isotropy actions of homogeneous spaces,
First Annual Graduate Student Geometric Group Theory and Related Topics Conference,
Tufts University (August 2016, invited)

Formality and equivariant formality for isotropy actions (in Portuguese),
XX Encontro Brasileiro de Topologia,
Universidade Tecnológica Federal do Paraná, Curitiba (July 2016)

Equivariant formality in rational cohomology and K-theory,
Conference on geometry in algebra and algebra in geometry,
Universidade de São Paulo (November 2015, invited)

Selected seminar talks

The topology of the Gelfand–Zeitlin fiber,
Symplectic seminar, IBS Center for Geometry and Physics, Pohang, Korea (December 2021)

[Title to be decided],
Differential geometry and topology seminar, Cambridge University (November 2021)

Biquotients and a product on the two-sided bar construction,
Algebraic topology seminar, Universidad Nacional Autónoma de México (May 2021)

Multiplicative collapse in the Eilenberg–Moore spectral sequence,
Algebraic topology seminar, University of Michigan (April 2020)

The K-theory of an isotropy action and an unsolved problem in polynomial rings (in Portuguese),
Seminário Salomônico, Universidade Federal Fluminense, Niterói, RJ, Brazil (August 2019)

Equivariant formality, K-theory, and isotropy,
Topology seminar, University of Rochester (October 2018)

Cohomogeneity-one actions and a little-remarked structure on the Mayer–Vietoris sequence,
Symplectic seminar, University of Toronto (March 2017)

Equivariant formality in rational cohomology and K-theory,
Geometry and Topology seminar, Western University (December 2016)

Equivariant formality of isotropy actions in rationalized cohomology and K-theory,
Seminário de física matemática, IMPA, Rio de Janeiro (May 2016)

Commensurable and incommensurable pseudo-Anosovs,
Tufts Geometric Group Theory and Topology Seminar (October 2010)

Selected teaching

Imperial College London

- Commutative Algebra (course coordinator and instructor)

Western University

- Directed Reading Program in Mathematics (mentor)

University of Toronto:

- Vector Calculus (course coordinator and instructor)

Universidade de São Paulo:

- Topologia Diferencial (group reading course facilitator)
- Equivariant Cohomology (seminar coordinator and lecturer)

Tufts University:

- Mathematics of Social Choice (course coordinator and instructor)
- Finite Mathematics (instructor)
- Differential Forms in Algebraic Topology (TA)
- Number Theory (TA)
- History of Mathematics (TA)
- Mathematical Neuroscience (grader)

Memberships

American Mathematical Society (AMS)

Association for Women in Mathematics (AWM)

Service

Co-organizer, "Equivariant geometry and topology" session of the 2016 Canadian Mathematical Society Winter Meeting in Niagara (with Elisheva Adina Gamse).

Referee, [six venues excised to preserve anonymity]

Editorial work

Editorial board, Poincaré Institute for Mathematics Education, Summer 2013
The Poincaré Institute is a NSF-funded collaboration between Tufts University and the non-profit Technical Education Research Centers designed to improve middle school mathematics education through graduate-level online courses offered to in-service middle school mathematics teachers.

Edited books and articles by Loring Tu (selected)

- *Introductory Lectures on Equivariant Cohomology*, Annals of Math. Studies 204, Princeton Univ. Press, Princeton, New Jersey, 2020.
- *Elements of Equivariant Cohomology*, with Raoul Bott, unpublished.
- *Differential Forms in Algebraic Topology*, 2nd edition, with Raoul Bott, edition in progress.
- *Differential Geometry: Connections, Curvature, and Characteristic Classes*, Grad. Texts in Math. 275, Springer, New York, 2017.
- *An Introduction to Manifolds*, [first and] second edition, Universitext, Springer, New York, 2011.
- Raoul Bott: *Collected Papers*, volume 5 [collection of permissions], Birkhäuser, Basel, 2017.
- From sheaf cohomology to the algebraic de Rham theorem (with Fouad El Zein), pp. 69–121 in *Hodge Theory*, eds. Eduardo Cattani, Fouad El Zein, Phillip A. Griffiths, and Lê Dũng Tráng, Princeton Univ. Press, Princeton, New Jersey, 2014.
- Computing characteristic numbers using fixed points, in *A Celebration of the Mathematical Legacy of Raoul Bott*, CRM Proceedings and Lecture Notes, vol. 50, American Mathematical Society, Providence, RI, 2010, pp. 185–206.

Feedback on and copyediting of other books

- *A Primer on Mapping Class Groups*, Benson Farb and Dan Margalit, Princeton Mathematical Series vol. 49, Princeton University Press, Princeton, NJ, 2011.
- *An Introduction to Modeling Neuronal Dynamics*, Christoph Börgers, Texts in Applied Mathematics vol. 66, Springer, New York, 2017.
- *Category Theory*, Steven Awodey, Oxford Logic Guides vol. 52, Oxford Univ. Press, New York, 2006.
- *Computability and Learnability*, Kevin Kelly, unpublished.
- *Metamathematics and Proof Theory*, Jeremy Avigad, unpublished.
- Introduction to the calculus of variations, William Hrusa, unpublished.

Languages

English: native (polished if ornate, a byproduct of formal overeducation)

Portuguese: fluent at the level of the news, but not of poetry

Mandarin: basic conversation (but worsening accent), menu comprehension

References

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