Jonathan S. Beardsley

University of Nevada, Reno
Department of Mathematics
327 DMSC
Reno, NV 89557

jbeardsley@unr.edu
jonathanbeardsley.com
Phone: 775-784-1408
Fax: 206-616-6974

Research Summary

I use homotopy theory and category theory to better understand concepts and structures from topology, geometry, and algebra. I have ongoing projects in the areas of derived noncommutative geometry, Galois and descent theory of structured ring spectra, chromatic homotopy theory, categorical invariants of singular knots, and Koszul duality.

Education

- Ph.D. in Mathematics, Johns Hopkins University, 2016
  Thesis Advisor: Jack Morava
  Thesis Title: "Coalgebraic Structure and Intermediate Hopf-Galois Extensions of Thom Spectra in Quasicategories"
- B.S. in Mathematics, University of Central Florida, 2010
  Thesis Advisor: Piotr Mikusiński
  Thesis Title: "A Sheaf of Boehmians"

Employment

- University of Nevada, Reno, Assistant Professor, 2020 – present
- Georgia Institute of Technology, Visiting Assistant Professor. 2019 – 2020
- University of Washington, Acting Assistant Professor, 2016 – 2019
- Johns Hopkins University, Graduate Teaching Assistant, 2010 – 2016

Submitted Work

1. "On Bialgebras, Comodules, Descent Data and Thom Spectra in ∞-categories," Submitted. (`arXiv:1810.00734`)
2. "Skeleta and Categories of Algebras" with T. Lawson. Submitted. (`arxiv:2110.09595`)

Published and Accepted Work

1. "Koszul Duality in Higher Topoi," with Maximilien Péroux, accepted for publication in *Homology, Homotopy and Applications*. Available at `arXiv:1909.11724`.
2. "The Operadic Nerve, Relative Nerve, and the Grothendieck Construction," with L.Z. Wong, *Theory and Applications of Categories*, 34 No. 13 (2019), 349–374.

3. "A Grothendieck Construction for Enriched Categories," with L.Z. Wong, *Advances in Mathematics* 344 (2019), 234–261.
4. "A Theorem on Multiplicative Cell Attachments with an Application to Ravenel's $X(n)$ Spectra," *Journal of Homotopy and Related Structures*, 14 (2019), 611–624.
5. "Toward a Galois Theory of the Integers Over the Sphere Spectrum," with J. Morava, *Journal of Geometry and Physics* 131 (2018), 41–51.
6. "A User's Guide: Relative Thom Spectra via Operadic Kan Extensions," Enchiridion: Mathematical User's Guides Vol. 3 (2017), 1–15.
7. "Relative Thom Spectra via Operadic Kan Extensions," Algebraic & Geometric Topology 17-2 (2017), 1151–1162.
8. "A Sheaf of Boehmians," with P. Mikusiński Ann. Pol. Math. 107 (2013), 293–307.

In Progress

1. "On stable homotopy over $\mathbb{F}_1$," with J. Moeller.
2. "The category of operators for a properad," with P. Hackney.

Grants

1. Simons Foundation, 5 Year Collaboration Grant for Mathematicians, *Higher Categorical Structure in Algebraic Topology, Geometry and Arithmetic*, Award #853272, $42,000.
2. NSF Grant, *Recent Developments in Noncommutative Algebra and Related Areas*, with James Zhang (DMS-1764210), $21,920.
3. NSF Grant, *2018 Young Topologists Meeting*, (DMS-1818905), $30,000.

Research Lectures

1. University of Glasgow, Geometry and Topology Seminar, "Braids and the Noncommutative Galois Theory of Algebra Over Stable Homotopy," 2022.
2. Ohio State University, Student Topology Seminar, "Three Equivalent Notions of Orientation for Thom Spectra," 2021.
3. University of Nevada, Reno, Mathematics and Statistics Colloquium "Some Galois Theory for Bordism Homology," 2020.
4. Jilin University, Third Conference on Operad Theory and Related Topics, "On the PROB of Singular Braids," 2020.
5. Johns Hopkins University, Conference on Riemann-Roch in Characteristic One and Related Topics, "Some Galois Extensions of $K(\mathbb{F}_1)$," 2019.
6. University of Nevada, Reno, Mathematics and Statistics Colloquium, "Generalized Galois Extensions in Derived Algebra," 2019.

7. University of Vermont, Mathematics Colloquium "Generalized Galois Extensions in Derived Algebra," 2019.
8. University of Louisiana at Lafayette, Topology Seminar, "Group Actions and Cogroup Coactions in ∞-topoi," 2019.
9. University of Illinois at Chicago, Algebraic K-theory Seminar, "Koszul Duality in Higher Topoi," 2019.
10. University of Nevada, Reno, Topology Seminar "Koszul Duality in Higher Topoi," 2019.
11. Universität Wuppertal, Bergische, Oberseminar Topologie, "Koszul Duality in Higher Topoi," 2019.
12. Ruhr-Universität Bochum, Oberseminar Topologie, "Koszul Duality in Higher Topoi," 2019.
13. University of British Columbia, Topology Seminar, "Comodule and Coalgebra Structure on Derived Quotients in ∞-categories," 2018.
14. University of Washington, Seattle Noncommutative Algebra Day, "An Operadic Approach to Noncommutative Geometry," 2018.
15. AMS Spring Western Sectional Meeting – Special Session on Algebraic Topology, Portland, "Operads of Singular and Virtual Braids," 2018.
16. Joint Mathematics Meetings – Special Session on Noncommutative Algebras and Noncommutative Invariant Theory, San Diego, "Toward Derived Hopf-Galois Extensions," 2018.
17. University of Washington, Seattle Noncommutative Algebra Day, "Some Hopf-Galois Extensions in the Derived Setting," 2017.
18. University of Regensburg, The Transatlantic Transchromatic Homotopy Theory Conference, "Structured Quotients of Ring Spectra and Obstructions to A_∞ Complex Orientations," 2017.
19. Macquarie University, Category Theory Seminar, "A Third Isomorphism Theorem for Thom Spectra and Hopf-Galois Extensions," 2017.
20. University of Melbourne, Mathematics Seminar, "Graphical Spaces as a Model for Infinity Properads," 2017.
21. University of British Columbia, 58th Cascade Topology Seminar, "Iterated Quotients of Ring Spectra and Spectral Torsors," 2017.
22. Temple University, Algebra Seminar, "An Introduction to Thom Spectra and Hopf-Galois Extensions," 2017.
23. University of British Columbia, Topology Seminar "Iterated Thom Spectra with Examples," 2016.
24. Ohio State University, Topology Seminar, "Hopf-Galois Extensions of Ring Spectra and the Nilpotence Theorem," 2015.
25. University of Chicago, Topology Seminar, "*MU* Without Manifolds," 2015.
26. University of Illinois, Urbana-Champaign, Topology Seminar, "Hopf-Galois Extensions of Ring Spectra and the Nilpotence Theorem," 2015.
27. École Polytechnique Fédérale de Lausanne, Young Topologists Meeting "Thom Spectra and Coalgebraic Structure," 2015.
28. Johns Hopkins University, Topology Seminar, "Non-Commutative Bialgebras in Spectra and Hopf-Galois Extensions," 2015.

29. University of Illinois Urbana-Champaign, Graduate Student Topology and Geometry Conference "Non-Commutative Bialgebras in Spectra and Hopf-Galois Extensions," 2015.
30. University of Virginia, Toplogy Seminar, "Ravenel's $X(n)$ Spectra as Iterated Hopf-Galois Extensions," 2015.
31. Ohio State University, Topology Seminar, "Ravenel's $X(n)$ Spectra as Iterated Hopf-Galois Extensions," 2014.
32. University of Regensburg, Modular Invariants in Topology and Analysis, "A New Class of Hopf-Galois Extensions in Chromatic Homotopy Theory," 2014.
33. University of Manchester, Structured Ring Spectra and Their Invariants, "Descent Cohomology and Twisted Forms in Homotopy Theory," 2014.

Expository Lectures

1. "Minicourse on ∞-categories," five day lecture series, University of Washington, 2022.
2. "A Very Brief Introduction to Stable Homotopy Theory," invited survey lecture, Roma Tre University, 2021.
3. "Symmetry, Topology and the Nobel Prize," lecture for high school students on topological phases of matter, given at the University of Washington's Math Day, 2018.
4. "The Nerve, the Bar Construction and Classifying Spaces," several lectures given in J. Zhang's student seminar, University of Washington, 2018.
5. "Simplicial Sets and Simplicial Homotopy Theory," several lectures given in J. Zhang's student seminar, University of Washington, 2017.
6. "An Introduction to Operads," several lectures given in J. Zhang's student seminar, University of Washington, 2017.
7. "An Introduction to Homotopy Theory," Current Topics Seminar, University of Washington, 2017.
8. "Stabilization of ∞-categories," West Coast Algebraic Topology Student Seminar, University of Oregon, 2013.

Awards

1. Nominee, University of Washington Postdoc Mentoring Award, 2018.
2. Hernandez Mathematics Award, University of Central Florida, 2010.

Service

- Co-organizer, *UNR Algebraic and Geometric Topology Seminar*, 2020-present
- Lead Acting Assistant Professor, University of Washington, 2018–2019
- Organizer, *University of Washington Topology Seminar*, 2017-2019
- Co-Organizer, *Young Topologists Meeting*, University of Copenhagen, 2018
- Co-organizer, *Recent Developments in Noncommutative Algebra and Related Areas*, University of Washington, 2018

- Co-organizer and Moderator, *Panel on Mental Health for Graduate Students in Math*, University of Washington, 2018
- Organizer, *AMS Special Session in Homotopy Theory*, University of California, Riverside, 2017
- Co-organizer, *Johns Hopkins Graduate Student Topology Seminar*, 2011–2016
- Referee, Algebraic & Geometric Topology, 2017-present
- Reviewer, Mathematical Reviews, 2017-present

Advising

- Suhyeon Lee, Brendan Murphy, Luke Trujillo, Research Experience for Undergraduates, "Hopf-algebras and Monoidal Categories," 2020
- Sebastian Gant, Undergraduate Thesis, "Reflective Subcategories of *Top*: Hausdorffization and the Like," 2018

Classes Taught

- Math 373–Theory of Positive Integers, University of Nevada, Reno
- Math 449/649–Category Theory and TQFTs, University of Nevada, Reno
- Math 295–Proof Writing, University of Nevada, Reno
- Math 2552–Differential Equations, Georgia Institute of Technology
- Math 324–Advanced Multivariable Calculus, University of Washington
- Math 300–Introduction to Mathematical Reasoning, University of Washington
- Math 441–Topology, University of Washington
- Math 443–Differential Geometry II, University of Washington
- Math 442–Differential Geometry I, University of Washington
- Math 301–Elementary Number Theory, University of Washington
- Math 498–Independent Study in Topology, University of Washington
- Math 308–Matrix Algebra, University of Washington
- Math 202–Vector Calculus, Johns Hopkins University
- Math 109–Calculus II, Johns Hopkins University