

KYLE MICHAEL ORMSBY
CURRICULUM VITAE

Department of Mathematics
University of Washington
Padelford Hall C-524
Seattle, WA 98195

(971) 276-3737
ormsbyk@uw.edu
kyleormsby.github.io
Pronouns: he or they

Research Interests

- Algebraic topology with an emphasis on motivic, equivariant, and combinatorial homotopy theory
- Geometric and topological data analysis applied to Alzheimer's disease and related dementia research

Education

- Ph.D., Mathematics, University of Michigan Ann Arbor, 2010
- B.A., Mathematics, University of Chicago, 2006

Appointments

- Visiting Associate Professor, Department of Mathematics, University of Washington, 2022 – present
- Co-Investigator, National Alzheimer's Coordinating Center, University of Washington, 2022 – present
- Associate Professor, Department of Mathematics, Reed College, 2020 – present
- Assistant Professor, Department of Mathematics, Reed College, 2014 – 2020
- Visiting Researcher, Mathematical Sciences Research Institute, 2014
- NSF Postdoctoral Fellow, Department of Mathematics, MIT, 2011 – 2014
- RTG Moore Instructor, Department of Mathematics, MIT, 2010 – 2011
- Visiting Researcher, Department of Mathematics, University of Oslo, August 2009

Publications

1. *Computations in stable motivic homotopy theory*, Ph.D. Thesis, University of Michigan, 2010, 1–84.
2. *Remarks on motivic homotopy theory over algebraically closed fields*, with Po Hu and Igor Kriz, *J. K-Theory* 7 (2011), no. 1, 55–89.
3. *Convergence of the motivic Adams spectral sequence*, with Po Hu and Igor Kriz, *J. K-theory* 7 (2011), no. 3, 573–596.
4. *Motivic invariants of p -adic fields*, *J. K-theory* 7 (2011), no. 3, 597–618.
5. *The homotopy limit problem for Hermitian K -theory, equivariant motivic homotopy theory, and motivic Real cobordism*, with Po Hu and Igor Kriz, *Adv. Math.* 228 (2011), no. 1, 434–480.
6. *Motivic Brown-Peterson invariants of the rationals*, with Paul Arne Østvær, *Geom. Top.* 17 (2013) 1671–1706.
7. *Stable motivic π_1 of low-dimensional fields*, with Paul Arne Østvær, *Adv. Math.* 265 (2014), 97–131.
8. *On the homotopy of $Q(3)$ and $Q(5)$ at the prime 2*, with Mark Behrens, *Algebr. Geom. Topol.* 16 (2016), no. 5, 2459–2534.
9. *Galois equivariance and stable motivic homotopy theory*, with Jeremiah Heller, *Trans. Amer. Math. Soc.* 368 (2016), no. 11, 8047–8077.
10. *The stable Galois correspondence for real closed fields*, with Jeremiah Heller, *New directions in homotopy theory*, *Cont. Math.* 707 (2018), 1–9.
11. *Primes and fields in stable motivic homotopy theory*, with Jeremiah Heller, *Geom. Topol.* 22 (2018), no. 4, 2187–2218.
12. *Vanishing in stable motivic homotopy sheaves*, with Paul Arne Østvær and Oliver Röndigs, *Forum Math. Sigma* 6 (2018), e3, 20pp.
13. *On the ring of cooperations for 2-primary connective topological modular forms*, with Mark Behrens, Nathaniel Stapleton, and Vesna Stojanoska, *J. Topol.* 12 (2019), no. 2, 577–657.

14. *The homotopy groups of the η -periodic motivic sphere spectrum*, with Oliver Röndigs, Pacific J. Math. 306 (2020), no. 2, 679–697.
15. *Biased permutative equivariant categories*, with Kayleigh Bangs, Skye Binegar, Young Kim, Angélica Osorno, David Tamas-Parris, and Livia Xu, Homology Homotopy Appl. 23 (2021), no. 1, 77–100.
16. *Self-duality of the lattice of transfer systems via weak factorization systems*, with Evan Franchere, Angélica Osorno, Weihang Qin, and Riley Waugh, Homology Homotopy Appl. 24 (2022) no. 2, 115–134.
17. *Saturated and linear isometric transfer systems for cyclic groups of order $p^m q^n$* , with Usman Hafeez, Peter Marcus, and Angélica Osorno, Topology Appl. 317 (2022), Paper No. 108162, 20pp.
18. *Model structures on finite total orders*, with Scott Balchin, Angélica Osorno, and Constanze Roitzheim, Math. Z. 304 (2023), no.3, Paper No. 40, 35pp.
19. *Lifting N_∞ operads from conjugacy data*, with Scott Balchin and Ethan MacBrough, to appear in Tunisian J. Math., arXiv:2209.06798, 24pp.
20. *Composition closed premodel structures and the Kreweras lattice*, with Scott Balchin and Ethan MacBrough, accepted in European J. Combinatorics, arXiv:2209.03454, 28pp.

Preprints

21. *Hochschild homology of mod- p motivic cohomology over algebraically closed fields*, with Bjørn Dundas, Mike Hill, and Paul Arne Østvær, submitted, arXiv:2204.00441, 27pp.
22. *The combinatorics of N_∞ operads for C_{qp^n} and D_{p^n}* , with Scott Balchin and Ethan MacBrough, submitted, arXiv:2209.06992, 20pp.
23. *A motivic analogue of the $K(1)$ -local sphere spectrum*, with William Balderrama and J.D. Quigley, submitted, arXiv:2307.13512, 9pp.
24. *Transfer systems for rank two elementary Abelian groups: characteristic functions and matchstick games*, with Linus Bao, Christy Hazel, Tia Karkos, Alice Kessler, Austin Nicolas, Jeremie Park, Cait Schleff, and Scotty Tilton, available at https://kyleormsby.github.io/files/tr_rank_two.pdf and to appear on the arXiv imminently, 25pp.

In preparation

25. *Discrete structures*, textbook with David Perkinson, draft at https://kyleormsby.github.io/files/113full_text.pdf, 193pp.
26. *Topological network analysis of beta-amyloid and tau in Alzheimer’s disease using PET imaging data*, with Yuexuan Wu, Dean Shibata, Yen-Chi Chen, Sarah Biber, Walter A. Kukull, and Kwun Chuen Gary Chan.
27. *Persistent symmetry: a homological approach to symmetry detection in images*, with Shanna Goldman, Olivia McGough, Angélica Osorno, and Dale Schandelmeier-Lynch.

Abstracts

1. *Topological network analysis of beta-amyloid and tau in Alzheimer’s disease using PET imaging data*, with Yuexuan Wu, Dean Shibata, Yen-Chi Chen, Sarah Biber, Walter A. Kukull, and Kwun Chuen Gary Chan, Alzheimer’s Association International Conference (2023).

Student papers supervised

1. Riley Thornton, *The homogeneous spectrum of Milnor-Witt K -theory*, J. Algebra 459 (2016), 376–388.
2. Ricardo Rojas-Echenique, *Injectivity and surjectivity of the Dress map*, J. Pure Appl. Algebra 220 (2016), no. 12, 3816–3820
3. Maxine Calle and Sam Ginnett with an appendix by Harry Chen and Xinling Chen, *The Tambara structure of the trace ideal for cyclic extensions*, J. Algebra 560 (2020), 114–143.
4. Maxine Calle and Sam Ginnett, *The spectrum of the Burnside Tambara functor of a cyclic group*, J. Pure Appl. Algebra 227 (2023), no. 8, Paper No. 107344, 23pp.

Undergraduate theses advised

1. Andrew Erlanger, *Dehn surgery* (2015)
2. Riley Thornton, *Some problems are hard : Borel complexity and C^* -algebras* (2016)
3. Joseph Joe (Mathematics/Physics, co-adviser Daniel Borrero), *256 shades of grey: topological analysis of the Gray-Scott model using persistence landscapes* (2016)
4. Chris Henn, *The modular flow in three homeomorphic spaces* (2018)
5. Alex Lloyd-Damjanovic, *Kronecker sequences and persistent homology* (2019)
6. Torin Woods-Eliot, *The type A cluster algebra and Catalan combinatorics* (2019)
7. Caroline Yearwood, *The dual Steenrod algebra and graph theory* (2019)
8. Jialun Zhao (Mathematics/Physics, co-adviser Andrew Larkoski), *The AdS_3/CFT_2 correspondence* (2019)
9. Rowen Bangs (Mathematics/Philosophy, co-adviser Paul Hovda), *This thesis is undeducible: Approaches for justifying the consistency of Peano arithmetic after Gödel* (2020)
10. Maxine Calle, *Morse theory and flow categories* (2020)
11. Anton Zavorotny, *Vassiliev knot invariants and the graph bialgebra of Lando* (2020)
12. Francis Baer, *Adams spectral sequence computations of $BP\langle 1 \rangle_* BP\langle 1 \rangle$* (2021)
13. Usman Hafeez, *\mathbb{A}^1 -Milnor numbers* (2021)
14. Albert Ji (Mathematics/Computer Science, co-adviser Mark Hopkins), *Universal Approximation and Interpolation in Neural Networks* (2021)
15. Weihang Qin (Mathematics/Computer Science, co-adviser Jim Fix), *Raymarching hyperbolic geometry* (2021)

Honors and Grants

- Co-Investigator on National Institute of Aging award U01 AG082350, *CLarity in ADRD Research Through Imaging (CLARiTI)*, \$149M, 2023–2028. (Contributed to grant writing, methods team member, 0.15FTE support.)
- Senior personnel on NSF award DMS-2135884, *RTG: Electronic Computational Homotopy Theory (eCHT) Research Community*, \$1.2M, 2022–2025. (Contributed to grant writing, served as Director for inaugural eCHT REU in 2023, PI of Reed College subaward.)
- NSF award DMS-2204365, *Motivic, operadic, and combinatorial homotopy theory* (joint with Angélica Osorno), \$345,010, 2022–2025.
- NSF award DMS-1709302, *Higher structures in stable, equivariant, and motivic homotopy theory* (joint with Angélica Osorno), \$368,000, 2017–2021.
- NSF conference grant DMS-1722545, *Homotopy theory in the ecliptic: chromatic, equivariant, and motivic mathematics* (joint with Angélica Osorno, Michael Hill, Agnès Beaudry, and John Lind), \$30,000, 2017.
- NSF conference grant DMS-1462793, *Equivariant and motivic homotopy theory* (joint with Angélica Osorno), \$28,000, 2015.
- NSF award DMS-1406327, *Structure and computations in motivic and chromatic homotopy*, \$172,146, 2014–2017.
- NSF Mathematical Sciences Postdoctoral Research Fellowship, \$135,000, 2011–2014
- Rackham One-Term Dissertation Fellowship, Winter 2010
- Honorable Mention, NSF Graduate Research Fellowship, 2006
- University of Chicago Phi Beta Kappa, 2005

Refereeing and Grant Review

- Annals of Mathematics, Documenta Mathematica, Journal of Homotopy and Related Structures, Journal of Topology, Mathematische Zeitschrift, National Science Foundation, New York Journal of Mathematics, Proceedings of the AMS

Academic and Professional Activities

- Co-organizer of an AMS Mathematics Research Community on homotopical combinatorics, Beaver Hollow, 2024
- Director for the Electronic Computational Homotopy Theory (eCHT) Research Experience for Undergraduates, virtual, 2023
- Co-organizer of the *Collaborative Mathematics Research Group*, a summer research program for Reed College undergraduates, 2023, 2020, 2019, & 2018
- Co-organizer of the University of Washington Topology Seminar, 2022 – present
- Project mentor for the Washington Experimental Mathematics Laboratory (WXML), 2022
- Lecturer for the Undergraduate Faculty Program, PCMI (virtual), 2021
- Founder and faculty liaison for the SL(m) (Social/Liaison Mathematics Group) at Reed College, 2019 – 2022
- Co-organizer of the Mathematics Teacher-Scholar Symposium (MaTSS), a two-day virtual conference encouraging emerging researchers committed to inclusive curricular and pedagogical practices to consider careers as teacher-scholars in a liberal arts setting, 2021
- Chair of the Reed College Department of Mathematics, 2020 – 2021
- Chair of the Academic Success Committee, 2020 – 2021
- Member of the Reed College Academic Planning Working Group (COVID response), summer 2020
- Organizer of the Reed College Mathematics Colloquium, 2014 – 2019 (joint with Jamie Pommersheim in 2014–15)
- Co-organizer of *Cascade Topology Seminar*, Portland State University, 2019
- Co-organizer of the special session *Homotopy Theory* at the AMS Spring Western/Central Sectional Meeting, University of Hawai‘i at Mānoa, 2019
- Invited participant, *Homotopy Harnessing Higher Structures* program at the Isaac Newton Institute of Mathematical Sciences, 2018
- Co-organizer of special session *Motivic Homotopy Theory* at the AMS Spring Western Sectional Meeting, Portland State University, 2018
- Co-organizer of *Underrepresented Students in Topology and Algebra Research Symposium (USTARS)*, Reed College, 2018
- Co-organizer of *Homotopy Theory in the Ecliptic: Chromatic, Equivariant, and Motivic Mathematics*, Reed College, 2017
- Organizer of *Project Project*, a summer research program for five Reed undergraduate students focused on mathematics visualization, 2017
- Invited participant, *Homotopical Methods in Algebraic Geometry*, Institut Mittag-Leffler, Sweden, 2017
- Invited participant, *Topology* workshop at the Mathematisches Forschungsinstitut Oberwolfach, Germany, 2016
- Co-organizer of *West Coast Algebraic Topology Summer School*, University of Oregon, 2016
- Co-organizer of *Equivariant Derived Algebraic Geometry* workshop at AIM, 2016.
- Co-organizer of *Cascade Topology Seminar*, Portland State University, 2015
- Organizer of the *K-group*, a summer research program for three Reed undergraduate students, 2015
- Co-organizer of *Equivariant and Motivic Homotopy Theory* conference, Reed College, 2015
- Invited participant, *Homotopy Theory* workshop at the Mathematisches Forschungsinstitut Oberwolfach, Germany, 2015
- Organizer of *Motivic Homotopy Seminar*, MSRI, 2014
- Invited participant, *Algebraic Topology* semester, MSRI, 2014
- Freshman academic advisor, MIT, 2012 – 2013
- Undergraduate research mentor for Peter Wear (Summer 2012), XiaoLin Shi (Spring 2012), and Taylor Han (Spring 2013)

- AMS Math Reviews contributor, 2012 – present
- MIT Mathematics CI Space contributor, Fall 2011, Spring 2011
- Summer Seminar on QFT organizer, Summer 2011
- Undergraduate Reading Seminar organizer, Univ. of Michigan, 2007 – 2009
- Michigan Math and Science Scholars teaching assistant, Summer 2009
- Undergraduate Math Club speaker, Univ. of Michigan, Winter 2009
- Young Scholars Program counselor, Univ. of Chicago, Summer 2005, Summer 2004

Teaching Experience

- Math 544–546, Topology & geometry of manifolds (UW), 2022–23
- Math 342, Topology (Reed), Spring 2021, Spring 2016
- Math 201, Linear Algebra (Reed), Spring 2021, Fall 2018
- Math 341, Topics in Geometry (Reed), Spring 2020
- Math 311, Complex Analysis (Reed), Spring 2019
- Math 113, Discrete Structures (Reed), Fall 2020, Spring 2020, Fall 2019, Spring 2019, Spring 2018, and Fall 2017
- Math 412, Topics in Algebra [Galois Theory] (Reed), Fall 2018
- Math 481, Independent study [of equivariant operads] (Reed), Fall 2018
- Math 202, Vector Calculus (Reed), Spring 2018
- Math 212, Multivariable calculus II (Reed), Spring 2016
- Math 138, Knot theory, knot practice (Reed), Fall 2015
- Math 211, Multivariable calculus I (Reed), Fall 2015
- Math 332, Abstract algebra (Reed), Spring 2015
- Math 112, Introduction to analysis (Reed), Spring 2015
- Math 481, Independent study [of 2-variable modular forms] (Reed), Spring 2015
- Math 481, Independent study [of Morse theory] (Reed), Spring 2015
- Math 111, Calculus (Reed), Fall 2014
- 18.A39, Knot theory seminar instructor (MIT), Fall 2012
- 18.02, Multivariable calculus recitation leader (MIT), Fall 2012, Fall 2010
- 18.100C, Analysis recitation leader with emphasis on communication (MIT), Fall 2011, Spring 2011
- Math 215, Multivariable calculus teaching assistant (Univ. of Michigan), Winter 2009
- Math 116, Integral calculus co-coordinator (Univ. of Michigan), Winter 2008
- Math 116, Integral calculus instructor (Univ. of Michigan), Fall 2007, Winter 2007
- Math 115, Differential calculus instructor (Univ. of Michigan), Fall 2006

Invited Presentations

- *N_∞ operads and the combinatorics of model structures*, Homotopy Theory Meeting, Oberwolfach Research Institute for Mathematics, 2023.
- *Counting in Catalan: handshakes, trees, & paths*, Math Hour, University of Washington, 2023.
- *Homotopical combinatorics*, Cascade Topology Seminar, University of British Columbia, 2023.
- *Some homotopy groups of S^0* , Electronic Computational Homotopy Theory Seminar, 2023.
- *Transfer systems and model structures for combinatorialists*, Combinatorics and Geometry Seminar, University of Washington, 2023.
- *Homotopical combinatorics*, Topology Seminar, University of Washington, 2022.
- *Homotopical combinatorics*, Special Session on Equivariant and Motivic Homotopy Theory at the AMS Western Sectional Meeting, virtual, 2021.
- *Weak factorization and transfer systems*, Algebraic topology seminar, University of Michigan Ann Arbor (virtual), 2020.
- *Weak factorization and transfer systems*, Cascade Topology Seminar, University of British Columbia (virtual), 2020.

- *Tambara generators for the trace ideal*, Algebraic topology seminar, UCLA, 2020.
- *Schröder numbers, separable permutations, and the C_2 -equivariant categorical Barratt-Eccles operad*, Topology seminar, University of Puget Sound, 2019.
- *The structure of the homotopy groups of the motivic sphere spectrum*, Topology seminar, University of Washington, 2019.
- *The structure of the homotopy groups of the motivic sphere spectrum*, Topology seminar, University of Oregon, 2019.
- *The η -periodic motivic sphere*, Homotopy Theory Summer Berlin (Motivic Homotopy Groups of Spheres: III), Berlin, Germany, 2018.
- *Towards the η -periodic motivic sphere*, Special Session on Structured Homotopy Theory at the AMS Central Sectional Meeting, Ann Arbor, Michigan, 2018.
- *Vanishing in motivic stable stems*, Mathematical Congress of the Americas, Montréal, Canada, 2017.
- *Vanishing in motivic stable stems*, Institut Mittag-Leffler, 2017.
- *Vanishing in motivic stable stems*, Topology seminar, MIT, 2016.
- *Primes and fields in stable motivic homotopy theory*, Motivic homotopy groups of spheres: II, Essen, Germany, 2016.
- *Level structures and cooperations in TMF*, Equivariant derived algebraic geometry, Banff International Research Station, 2016.
- *Regular polytopes in three and more dimensions*, F.L. Griffin MathFest, Reed College, 2016.
- *Galois equivariance and stable motivic homotopy theory*, Topology seminar, University of British Columbia, 2015.
- *Motivic homotopy groups over low-dimensional fields*, West Coast Algebraic Topology Summer School, University of Oregon, 2015.
- *Homotopy theoretic perspectives on groups and varieties*, Oregon State University Mathematics Colloquium, Salem, Oregon, 2015.
- *Cooperations in K -theory and topological modular forms*, University of Oregon Topology Seminar, Eugene, Oregon, 2015.
- *Connective, effective, and essential Hermitian K -theory*, Special Session on Homotopy Theory at the AMS Western Sectional Meeting, San Francisco, California, 2014.
- *Galois equivariance and motivic homotopy*, Geometry Topology seminar, Georgia Institute of Technology, 2013.
- *Galois equivariance and motivic homotopy*, Topology seminar, MIT, 2013.
- *Motivic stable stems*, Topology seminar, Stanford University, 2013.
- *Quaternions and Dirac's belt trick*, Reed College mathematics colloquium, 2013.
- *Towards the first motivic stable stem*, Workshop on Equivariant, Chromatic, and Motivic Homotopy Theory, Northwestern University, 2013.
- *Algebraic deformations of rational functions*, Reed College mathematics colloquium, 2013.
- *Motivic Brown-Peterson invariants of the rationals*, Topology seminar, MIT, 2012.
- *Chromatic red shift*, West Coast Algebraic Topology Summer School: Advances in K -theory, Stanford University, 2012.
- *TMF cooperations*, Virginia Conference on Algebraic Topology, University of Virginia, 2012.
- *Tate normal form in level resolutions of the $K(2)$ -local sphere*, Topology seminar, University of Minnesota, 2012.
- *Tate normal form in level resolutions of the $K(2)$ -local sphere*, Topology seminar, University of Virginia, 2011.
- *Tate normal form in level resolutions of the $K(2)$ -local sphere*, Topology seminar, Johns Hopkins University, 2011.
- *New advances in topological modular forms*, Topology seminar, University of Michigan, 2011.
- *Tate normal form in level resolutions of the $K(2)$ -local sphere*, Topology seminar, MIT, 2011.

- *Equivariant motivic homotopy and the completion problem for Hermitian K-theory*, Algebra seminar, University of Southern California, 2011.
- *Equivariant motivic homotopy and the completion problem for Hermitian K-theory*, Toplogy seminar, MIT, 2010.
- *Equivariant motivic homotopy and the completion problem for Hermitian K-theory*, Geometric aspects of motivic homotopy theory, Bonn, Germany, 2010.
- *The motivic alpha family over p-adic fields*, Geometry/topology seminar, University of Western Ontario, 2010.
- *The motivic alpha family over p-adic fields*, Topology seminar, University of Notre Dame, 2009.
- *The motivic alpha family over p-adic fields*, Topology seminar, University of Illinois Urbana-Champaign, 2009.
- *Computations in stable motivic homotopy theory*, Topology seminar, University of Oslo, 2009.
- *Computations in stable motivic homotopy theory*, Graduate Student Topology & Geometry Conference, University of Wisconsin Madison, 2009.
- *Some remarks on 2-completed motivic homotopy theory and the motivic J-homomorphism*, Topology seminar, University of Chicago, 2009.
- *Some remarks on 2-completed motivic homotopy theory and the motivic J-homomorphism*, AMS Special Session on Homotopy Theory and Higher Categories, Joint Mathematics Meeting, Washington, D.C., 2009.