

MICHAEL CHING - CURRICULUM VITAE

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EMPLOYMENT

- **Amherst College**
Professor of Mathematics (2023-present)
Associate Professor of Mathematics (2017-2023)
Assistant Professor of Mathematics (2011-2017)
- **University of Georgia**
Assistant Professor of Mathematics (2008-2011)
- **The Johns Hopkins University**
J.J. Sylvester Assistant Professor (2005-2008)

EDUCATION

- **Massachusetts Institute of Technology** (2001-2005)
Ph.D. Mathematics June 2005
Thesis Advisor: Haynes Miller
- **University of Cambridge - Trinity College** (1997-2001)
M.A. Mathematics February 2004 (automatically conferred three years after B.A.)
Certificate of Advanced Study in Mathematics, June 2001
B.A. Mathematics (Hons.), First Class, June 2000

EXTERNAL FUNDING AND VISITING POSITIONS

- NSF Research Grant: DMS-1709032: RUI: Calculus of Functors and Applications in Homotopy Theory (July 2017 - June 2021)
- NSF Research Grant: DMS-1308933: RUI: Koszul Duality of Operads and the Calculus of Functors (July 2013 - June 2017)
- NSF Research Grant: DMS-0968221: FRG: The Calculus of Functors and the Theory of Operads: Interactions and Applications (June 2010 - May 2013)
- Research Visitor: Isaac Newton Institute, Cambridge, UK (Sept - Dec 2018)
- Research Visitor: Hausdorff Trimester Program, Bonn, Germany (July 2015)
- Visiting Assistant Professor: Massachusetts Institute of Technology (Sept - Dec 2014)
- Research Member: Mathematical Sciences Research Institute (January - May 2014)

PUBLICATIONS AND PREPRINTS

18. *Dual tangent structures for ∞ -toposes*
arxiv:2101.08805, 18 pages, submitted to Theory and Application of Categories
17. *Tangent ∞ -categories and Goodwillie calculus*
arxiv:2101.07819, 128 pages
submitted to Memoirs of the American Mathematical Society, under revision
(joint with Kristine Bauer and Matthew Burke)
16. *Koszul duality for topological E_n -operads*
Proceedings of the London Mathematical Society 125 (2022), 1–60
(joint with Paolo Salvatore)
15. *Infinity-operads and Day convolution in Goodwillie calculus*
Journal of the London Mathematical Society 104(3) (2021), 1204–1249
14. *Goodwillie Calculus*
Handbook of Homotopy Theory, CRC Press (2020), 1–38
(joint with Gregory Arone)
13. *Derived Koszul duality and TQ-homology completion of structured ring spectra*
Advances in Mathematics 341 (2019), 118–187
(joint with John E. Harper)
12. *A nilpotent Whitehead theorem for TQ-homology of structured ring spectra*
Tbilisi Mathematical Journal 11(3) (2018), 69–79
(joint with John E. Harper)
11. *Manifolds, K-theory and the calculus of functors*
Contemporary Mathematics 682 (2017), 1–38
(joint with Gregory Arone)
10. *Cross-effects and the classification of Taylor towers*
Geometry & Topology 20-3 (2016), 1445–1537
(joint with Gregory Arone)
9. *Higher homotopy excision and Blakers-Massey theorems for structured ring spectra*
Advances in Mathematics 298 (2016), 654–692
(joint with John E. Harper)
8. *A classification of Taylor towers for functors of spaces and spectra*
Advances in Mathematics 272 (2015), 471–552
(joint with Gregory Arone)
7. *Coalgebraic models for combinatorial model categories*
Homology, Homotopy and Applications 16(2) (2014), 171–184
(joint with Emily Riehl)
6. *A note on the composition product of symmetric sequences*
J. Homotopy Relat. Struct. 7 (2012), 237–254
5. *Apollonian circle packings of the half-plane*
Journal of Combinatorics 3 (2012), 1–49
(joint with John Doyle)
4. *Bar-cobar duality for operads and modules of spectra*
Journal of Topology 5 (2012), 39–80

3. *Operads and chain rules for the calculus of functors*
Astérisque 338 (2011), 158 pages
(joint with Gregory Arone)
2. *A chain rule for Goodwillie derivatives of functors from spectra to spectra*
Trans. Amer. Math. Soc. 362 (2010), 399–426
1. *Bar constructions for topological operads and the Goodwillie derivatives of the identity*
Geometry & Topology 9 (2005), 833–933

INVITED TALKS

- 2023:
 - ***Tangent ∞ -Categories and Goodwillie Calculus***
Northeastern University (March 2023)
University of Massachusetts - Amherst (March 2023)
- 2021:
 - ***Bar-Cobar Duality for Stable E_n -Operads***
Operads, Calculus and Homotopy Theory in Topology, Lille, France (July 2021)
 - ***Dual Tangent Structures for ∞ -Toposes***
Tangent Categories and Applications, Banff, Canada (online, June 2021)
Notre Dame Topology Seminar (online, April 2021)
 - ***Day Convolution and Goodwillie Derivatives***
Princeton University Algebraic Topology Seminar (online, April 2021)
 - ***Tangent ∞ -Categories and Goodwillie Calculus***
Masaryk University Algebra Seminar, Brno, Czech Republic (online, April 2021)
Warwick Algebraic Topology Seminar (online, March 2021)
University of Virginia Topology Seminar (online, February 2021)
- 2020:
 - ***Goodwillie Calculus and Operads***
Operad Pop-up Conference (online, August 2020)
 - ***Representable Tangent ∞ -Categories and Functor Calculus***
Calgary Peripatetic Seminar (online, July 2020)
 - ***Tangent ∞ -Categories and Goodwillie Calculus***
MIT Topology Seminar (online, April 2020)
Binghamton University Geometry and Topology Seminar (February 2020)
- 2019:
 - ***Self-Koszul-Duality of Stable E_n -Operads***
Equivariant Topology and Derived Algebra, Trondheim, Norway (July 2019)
 - ***Tangent ∞ -Categories and Goodwillie Calculus***
Foundational Methods in Computer Science, Kananaskis, AB (2 talks, May 2019)
Current Directions in Homotopical Algebra, Pohang, Korea (May 2019)
Johns Hopkins University Topology Seminar (March 2019)
 - ***Pro-Operads and the Classification of Taylor Towers for Spectrum-Valued Functors***
Workshop on Functor Calculus, Ohio State University, Columbus, OH (March 2019)
 - ***Inequality***
Brown University Math Department Horizons Seminar (February 2019)
- 2018:

- *Pro-Operads and the Classification of Taylor Towers for Spectrum-Valued Functors*
Transpennine Topology Triangle, Sheffield, UK (October 2018)
- *Tangent ∞ -Categories and Goodwillie Calculus*
Isaac Newton Institute, Cambridge, UK (October 2018)
Stockholm University Topology Seminar, Sweden (September 2018)
- *Day Convolution, ∞ -Operads and Goodwillie Calculus*
Category Theory 2018, University of the Azores, Portugal (July 2018)
Workshop on Infinity-Operads, Utrecht, Netherlands (June 2018)
AMS Sectional Meeting, Columbus, OH (March 2018)
University of Calgary Peripatetic Logic and Category Theory Seminar (March 2018)
- 2017:
 - *Operads, Pro-Operads and the Calculus of Functors*
MIT Topology Seminar (December 2017)
 - *Apollonian Circle Packings*
Amherst College Math Colloquium (February 2017)

RECENT AND UPCOMING CONFERENCES

- A Panorama of Homotopy Theory, Oxford, United Kingdom (June 2023)
- Operads, Calculus and Homotopy Theory Workshop, Lille, France (online, July 2021)
- BIRS Workshop: Tangent Categories and their Applications, Banff, Canada (online, June 2021)
- Operad Pop-Up Conference (online, August 2020)
- Equivariant Topology and Derived Algebra, Trondheim, Norway (July 2019)
- SYM 10 Years Old, Copenhagen, Denmark (June 2019)
- Foundational Methods in Computer Science, Kananaskis, AB (May 2019)
- Current Directions in Homotopical Algebra, Pohang, Korea (May 2019)
- Workshop on Functor Calculus, Ohio State University, Columbus, OH (March 2019)
- Homotopy Harnessing Higher Structures, Isaac Newton Institute, Cambridge, England (September - December 2018)
- AMS Sectional Meeting, Columbus, OH (March 2018)
- Homotopy Theory in the Ecliptic, Reed College, Portland, OR (August 2017)
- Alpine Conference on Applied and Algebraic Topology, Saas, Switzerland (August 2016)
- Topology of Manifolds, Lisbon, Portugal (June 2016)
- Workshop on Homotopy Type Theory, Fields Institute, Toronto, Canada (May 2016)

PROFESSIONAL SERVICE

- Peer reviewer for 14 journals
- NSF external panel reviewer for Division of Mathematical Sciences
- Co-organizer of AMS Section Meeting Special Session, University of Massachusetts - Amherst (October 2022)
- PhD Thesis External Examiner:
 - Kaya Arro, Brown University (May 2023)
 - Ben MacAdam, University of Calgary (December 2021)
 - Luis Pereira, MIT (April 2013)
- MIT-Talbot Workshop Mentor (May 2012)
- Co-organizer of Banff International Research Station Workshop on Functor Calculus and Operads (March 2011)

- Main organizer for Georgia Topology Conference (May 2010)
- Co-organizer for Georgia International Topology Conference (May 2009)

TEACHING AT AMHERST COLLEGE

- **Math 111i: Introduction to Calculus (Intensive)** (Fall 2017, Fall 2016, Fall 2015)
first-semester calculus: limits, derivatives, integration (25-35 students)
- **Math 111: Introduction to Calculus** (Fall 2022, Fall 2019, Fall 2013, Fall 2012, Fall 2011)
first-semester calculus: limits, derivatives, integration (20-30 students)
- **Math 121: Intermediate Calculus** (Spring 2012)
second-semester calculus: integration techniques, sequences and series (20 students)
- **Math 205: Inequality** (Spring 2018, Spring 2017)
K-12 math education in the U.S., co-taught and cross-listed with History and Black Studies (25 students)
- **Math 211: Multivariable Calculus** (Spring 2023, Fall 2020, Fall 2017, Spring 2015, Spring 2013, Fall 2012, Fall 2011)
curves in \mathbb{R}^n , functions of several variables, Stokes' Theorem (25-50 students)
- **Math 220: Discrete Mathematics** (Fall 2021, Spring 2021, Fall 2020, Spring 2016)
introduction to proof-writing, relations, functions (20-35 students)
- **Math 256: Combinatorial Geometry: Packings and Polytopes** (Fall 2023)
survey course on geometry: polyhedra, tilings, and sphere packings (16 students)
- **Math 271: Linear Algebra** (Spring 2017, Fall 2016, Fall 2015)
linear systems, matrices, vector spaces, linear transformations (35 students)
- **Math 355: Introduction to Analysis** (Spring 2019, Spring 2012)
rigorous single-variable mathematical analysis (25 students)
- **Math 385: Mathematical Logic** (Spring 2022, Fall 2019, Spring 2018)
propositional and predicate calculi, completeness and incompleteness (10 students)
- **Math 410: Galois Theory** (Spring 2016, Fall 2013)
field extensions, Galois Correspondence, solvability by radicals (2-9 students)
- **Math 455: Topology** (Spring 2021, Spring 2019, Spring 2015, Spring 2013)
an introduction to point-set and algebraic topology (10-20 students)
- **Special Topics courses taught:**
 - Motivic Homotopy Theory (Spring 2015)
 - Topics in Math Education (Spring 2015, Spring 2016)
 - Readings in Mathematics - Half Course (Spring 2015)
 - Homotopy Type Theory (Spring 2016)
 - Game Theory (Spring 2017)
 - Algebraic Topology (Spring 2017)
 - Reflections on Calculus (Fall 2017)
 - Higher Category Theory (Spring 2018)
 - Rational Homotopy Theory (Spring 2018)
 - Category Theory (Spring 2019)
 - Computer-Aided Proof (Spring 2019, Fall 2019)
- **Summer Research Students (Greg Call Academic Interns):**
 - Michael Barnes (2020)
 - Nathan Kim (2020)
 - Leo Xu (2020)
 - Eugene Melnyk (2021, 2022)

- **Senior Thesis Students:**

- Sunny Xiao (2013-14, summa cum laude; PhD Brown University 2020):
1 – 2 Quadruples in Self-Similar Unbounded Apollonian circle packings
- Kaya Arro (2015-16, magna cum laude; PhD Brown University 2023):
The Maximal and Free (∞, n) -Categories of an $(\infty, n + 1)$ -Category
- Fraser Binns (2016-17, magna cum laude; PhD Boston College 2023):
The Kervaire Invariant of the Lie Framed Torus
- Faseeh Ahmad (2017-18, unfinished):
Rational Homotopy Theory
- Michael Barnes (2020-21, unfinished):
Strong Conceptual Completeness and Category Theory
- Eugene Melnyk (2021-22, unfinished):
Tangent Categories and Commutative Algebra
- Audrey Rosevear (2021-22, summa cum laude; primarily advised by Weimin Chen (UMass)):
From Three Dimensions to Four in The Minimal Genus Problem
- Keane Ng (2022-23, summa cum laude):
Homology Theories and Poincaré Duality
- David Metacarpa (2023-24):
Localization and Completion in Homotopy Theory

COLLEGE SERVICE

- Science Faculty Steering Committee (2021-2023)
- Faculty Committee on Adjudication (2020-2023)
- Faculty Committee on Student Fellowships (2017-2018)
- Faculty Computing Committee (2015-2017)

DEPARTMENTAL SERVICE

- Department Chair (2021-2023)
- Tenure Case Coordinator (2023)
- Course Scheduler (2022-2024)
- Putnam Exam Coordinator (2021)
- Petition/List Coordinator (2020-2022)
- Math Fellows Co-coordinator (2019)
- Mellon Grant Committee (2019)
- Visiting Faculty Search Committee Chair (2019)
- Walker Prizes Coordinator (2016-2021)
- Faculty Search Committees (2012-2013, 2015-2017)
- MAA Student Chapter and Math Club Advisor (2012-2013, 2015-2017)
- Math Colloquium Coordinator (2015)
- Putnam Exam Problem-Solving Sessions (2011, 2012, 2013)

SCHOLARSHIPS AND AWARDS

- Amherst College Senior Sabbatical Fellowship (2018, 2020)
- Amherst College Lazerowitz Lectureship (2016)
- Amherst College Trustee Faculty Fellowship (2014)
- Excellence in Teaching Award (JHU Department of Mathematics, 2007)

- Dean's Educational & Student Advising Award (MIT School of Science, 2005)
for dedication to educational programs and student advising
- MIT Graduate Assistantship (2002-2005)
- Kennedy Memorial Trust Scholarship (2001-2002)
- Senior Scholar (University of Cambridge - Trinity College) (1999-2001)
- Yeats Mathematical Essay Prize (University of Cambridge - Trinity College) (1999)
- International Mathematical Olympiad: Gold Medal (1996), Silver Medal (1997)