

Ryan Cohen Reich

Curriculum vitae

Education

- 2005–2011 **Ph.D Mathematics**, *Harvard University*, Cambridge, MA.
- 2005–2006 **A.M. Mathematics**, *Harvard University*, Cambridge, MA.
- 2001–2005 **A.B. Mathematics**, *University of Chicago*, Chicago, IL.
- 1997–2001 **Diploma**, *Stuyvesant High School*, New York City.

Positions held

- 2012–present **RTG postdoc**, *U. Michigan*, Ann Arbor, MI.
- 2011–2012 **Lecturer**, *UCLA*, Los Angeles, CA.
- 2005–2011 **Graduate student**, *Harvard University*, Cambridge, MA.

Publications

- [1] Ryan Cohen Reich, *Obvious natural morphisms of sheaves are unique*, *Theory Appl. Categ.* **29** (2014), no. 4, 48–99, available at <http://arxiv.org/abs/1307.4678>.
- [2] ———, *Twisted geometric Satake equivalence via gerbes on the factorizable grassmannian*, *Represent. Theory* **16** (2012), 345–449.
- [3] Ryan Reich, *Notes on Beilinson’s “How to glue perverse sheaves”*, *J. Singul.* **1** (2010), 94–115.

Degree work

Ph.D dissertation

Title Twisted geometric Satake equivalence via gerbes on the factorizable grassmannian

Advisor Dennis Gaitsgory

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RTG postdoctoral fellow

Abstract I prove a generalization of the Satake equivalence of Mirković–Vilonen that incorporates perverse sheaves twisted by a factorizable gerbe. The main results include a classification of such gerbes as well as new, more conceptual and geometric proofs of the main ingredients of the proof of the Satake equivalence.

A.M (“minor”) thesis

Title The multiplicity one theorems for GL_n

Advisor Dennis Gaitsgory

Abstract This was an expository paper on the proof of the theorem, for automorphic representations of GL_n , that any such representation has exactly one homomorphism to the space of automorphic functions. It also proves the “strong” multiplicity one theorem, that any two such representations must differ at infinitely many places. I work only over function fields.

A.B. research paper

Title An introduction to K-theory: Two equivalent approaches

Advisor Jesper Grodal

Abstract This paper, completed jointly with Matthew Gelvin, is an exposition of the basics of topological K-theory. In my portion, I give the definition via vector bundles, prove Bott periodicity, and close with an application showing the nonexistence of H-space structures on spheres other than S^1 , S^3 , and S^7 via the Adams operations.

Teaching experience

- U. Michigan (2012–present)
 - In both of the following courses I was in complete charge of my section; there were no uniform assignments or exams.
 - *Math 285*: Honors calculus III (multivariable). This was furthermore the “advanced section” for students expected to have seen proofs. This course was partially inquiry-based, with one hour out of four per week devoted to group work. 22 students.
 - *Math 286*: Honors calculus IV (differential equations). The sequel to my previous course. It had no IBL component, and instead I wrote a complete set of instructional notes parallel to the textbook presenting

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- the subject from my preferred perspective. 18 students.
- UCLA (2011–2012)
 - For all courses I was the sole instructor, determining the syllabus, writing exams, and setting grades.
 - *Math 3b*: first-year calculus for non-majors, course capacity 210.
 - *Math 33b* (twice): differential equations, mostly engineering and science students, course capacity 210.
 - *Math 61*: discrete mathematics, mostly computer science students, course capacity 70.
 - Harvard tutorials (advanced seminar-style courses for math majors)
 - For these courses I set the syllabus, assigned final projects, and determined grades.
 - *Algebraic groups* (Summer 2010): from Humphreys' book *Affine algebraic groups*. Representation theory up through an outline of highest-weight theory. Six students.
 - *Tropical geometry* (Fall 2008): no textbook. Outline: amoebas, tropicalization; tropical (projective) plane curves and analogues of geometric theorems; deduction of Bézout's theorem from the tropical one; speculative material on tropical Hilbert polynomials.
 - Harvard courses
 - All courses approx. 30 students, supervised by teaching faculty.
 - *Math 1a* (Fall 2006), *Math 1b* (Spring 2011): first-year calculus for non-majors.
 - *Math 21b* (Spring 2008, two sections in Spring 2010): linear algebra for non-majors. Includes one month on applications to ordinary differential equations and Fourier series for solving the heat and wave equations.
 - Research Science Initiative (RSI) mentoring
 - Six-week program for gifted high school students.
 - Summer 2007: advised Laney Kuenzel (game theory), Qiaochu Yuan (algebraic geometry). Laney won the best paper prize; Qiaochu was a finalist in the Intel Science Talent Search.
 - Summer 2008: advised Zane Li (algebraic geometry), Peter Zhang (abstract algebra). Peter was an Intel semifinalist.

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Conferences and seminars

- Fall 2010 **Langlands Duality in Representation Theory and Gauge Theory**, Hebrew University.
Semester program organized by D. Gaitsgory and D. Kazhdan. Seminars: higher category theory and derived algebraic geometry; mathematical physics; representations of adelic groups and Drinfeld's 1983 paper. Lecture series by R. Bezrukavnikov, J. Solomon, D. Gaitsgory, D. Nadler.
- August 2010 **Invited talk at the Worldwide Center of Mathematics**, Cambridge, MA.
On *Notes on Beilinson's "How to glue perverse sheaves"* at the invitation of David Massey. Video available at <http://www.centerofmath.org/research2/video/reich.mp4>.
- 2009–2010 **Geometric Representation Theory**, Harvard University.
Year-long seminar organized by D. Gaitsgory. Studied the book *Quantization of Hitchin's integrable system...*, by Beilinson and Drinfeld.
- Summer 2009 **Geometric Representation Theory and Extended Lie Algebras**, University of Ottawa.
Summer school and conference organized by E. Neher and A. Savage. One-week courses on geometric construction of representations, quantum groups and crystals, extended affine Lie algebras, W-algebras.
- April 2007 **The Geometric Langlands Correspondence**, Oxford University.
Lecture series by D. Ben-Zvi.

Awards and honors

- 2009 Certificate of Distinction in Teaching
- 2005 Paul R. Cohen Memorial Prize (\$3000)
- 2005 Student marshal
- 2002–2005 Dean's List
- 2004 Phi Beta Kappa
- 2004 Barry M. Goldwater Scholarship (\$7500)

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