Patrick K. McFaddin
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Education

Ph.D., Mathematics — May 2016
University of Georgia — Athens, GA

- Advisor: Daniel Krashen
- Dissertation: K-Cohomology of Generalized Severi-Brauer Varieties

M.A., Mathematics — August 2011
University of Georgia — Athens, GA

- Advisor: Robert Varley

B.A., with Honors in Mathematics — May 2010
University of Southern California — Los Angeles, CA

Research Interests

Algebra and algebraic geometry: algebraic K-theory, K-cohomology, algebraic cycles, motives, central simple algebras, algebraic groups, homogenous varieties

Publications

1. The group of K_1-zero-cycles on the second generalized Severi-Brauer variety of an algebra of index 4. (arXiv)
2. (with V. Alexeev, et al.) Extended Torelli map to the Igusa blowup in genus 6, 7, and 8. Experimental Mathematics, Vol. 21(2), pp. 193-203 (2012).
3. (with E. J. Rhodes, et al.) Temporal changes in the frequencies and widths of the solar p-mode oscillations. Proceedings of SOHO 24/GONG 2010, pp. 134-138 (2011).
4. (with E. J. Rhodes, et al.) Temporal changes in the frequencies of the solar p-mode oscillations during solar cycle 23. Proceedings of the International Astronomical Union, Vol. 6, Symposium S273, pp. 389-393 (2011).

Work in Progress

1. Patching over fields and étale K-theory.
2. K_1-zero-cycles on generalized Severi-Brauer varieties.
3. The Chen-Gibney-Krashen moduli spaces revisited.
   (with P. Gallardo, N. Giansiracusa, and X. Wu).
4. A cocycle-free proof of a theorem of Uematsu on the Brauer group of affine diagonal quadrics.
   (with R. Gordon-Sarney, D. Adams, D. Litt, S. Mathur).

Selected Talks

Subfields of Central Simple Algebras Feb. 2016
Math Department Colloqium, California State University Sacramento

Chow Groups with Coefficients and Generalized Severi-Brauer Varieties Feb. 2016
Algebra and Number Theory Seminar, Emory University

K-Cohomology of Generalized Severi-Brauer Varieties Sept. 2015
Algebra Seminar, University of Georgia

Twisted Homogenous Varieties, Derived Equivalences, and dg-Stacks Jan. 2015
Algebra Seminar, University of Georgia

Conferences and Workshops Attended

Georgia Algebraic Geometry Symposium Oct. 2015
Emory University

Local-Global Principles and Their Obstructions Oct. 2015
University of Pennsylvania

Grad Student Bootcamp for the Alg. Geom. Research Institute July 2015
University of Utah

The 12th Brauer Group Conference June 2015
Pingree Park, CO

Arizona Winter School: Arithmetic and Higher-Dimensional Varieties March 2015
University of Arizona

Georgia Algebraic Geometry Symposium Oct. 2014
University of Georgia

Representation Theory and K-Theory May 2014
University of Southern California

Southeastern Lie Theory Workshop May 2014
University of Georgia

Georgia Algebraic Geometry Symposium Oct. 2013
University of Georgia

Torsors, Nonassociative Algebras, and Cohomological Invariants June 2013
Fields Institute

Homotopical Methods in Algebraic Geometry May 2013
University of Southern California

Workshop on Torsors, Motives, and Cohomological Invariants May 2013
Fields Institute

Oberwolfach Seminar on Algebraic Groups and Patching Oct. 2012
Mathematisches Forschungsinstitut Oberwolfach

Georgia Algebraic Geometry Symposium May 2012
University of Georgia

VIGRE Summer School Program in Algebraic Geometry May 2012
University of Georgia

Arizona Winter School: Ramification and Geometry March 2012
University of Arizona

Algebraic Geometry Northeastern Series Workshop Oct. 2011
Stony Brook University

A Celebration of Algebraic Geometry Aug. 2011
Harvard University

K-Theory and Motives March 2011
University of California, Los Angeles

Compact Moduli and Vector Bundles May 2010
University of Georgia

Awards

Great Lakes National Scholarship August 2015
Great Lakes Educational Loan Services

Outstanding Teaching Assistant March 2015
University of Georgia

VIGRE Fellowship August 2011 - July 2012

Outreach

University of Georgia Math Camp June 2016
Graduate Instructor July 2014

Project REFOCUS Spring 2016
21st Century Skills Program Volunteer Fall 2015

University of Georgia High School Math Tournament November 2014
Volunteer November 2013

A Place Called Home Non-Profit Youth Center Spring 2008
Volunteer Tutor, K-12, all subjects

References

Daniel Krashen
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University of Georgia
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Research

- **Representations, cohomology, and geometry of Lie superalgebras.**

  I am studying the relative cohomology ring $\mathrm{H}^\bullet(\mathfrak{g}, \mathfrak{l}; \mathbf{C})$ of a Lie superalgebra $\mathfrak{g} = \mathfrak{g}_{\bar{0}} \oplus \mathfrak{g}_{\bar{1}}$ relative to a reductive subalgebra $\mathfrak{l} \subseteq \mathfrak{g}_{\bar{0}}$. My conjecture is that $\mathrm{H}^\bullet(\mathfrak{g}, \mathfrak{l}; \mathbf{C})$ is finitely generated over $\mathrm{H}^\bullet(\mathfrak{g}, \mathfrak{g}_{\bar{0}}; \mathbf{C})$ and that there is a very nice spectral sequence abutting to this relative cohomology. Once this is established I will be able to use algebro-geometric techniques to investigate the mapping of support varieties induced by $\mathrm{H}^\bullet(\mathfrak{g}, \mathfrak{g}_{\bar{0}}; \mathbf{C}) \to \mathrm{H}^\bullet(\mathfrak{g}, \mathfrak{l}; \mathbf{C})$.

  This research relies heavily on work by Benson, Boe, Carlson, Friedlander, Gruson, Hochschild, Kujawa, Nakano, Parshall, and Serre.

- **Tropical geometry, algebra, and Grassmannians**

  The Grassmannian $\mathrm{Gr}(d, n)$ is often identified with the image of the Plücker embedding. This variety is isomorphic to the GIT quotient of $\mathrm{M}_{d\times n}$ by the (left) action of GL_d. There has been much interest in defining tropical analogues of the Grassmannian, with several constructions due to Speyer and Sturmfels. With N. Giansiracusa, I have been working on an analogue that mimics the GIT construction. We have discovered many interesting similarities and many interesting differences when compared to the classical theory.

  This research relies heavily on work by Fink, G. Giansiracusa, N. Giansiracusa, Rincón, Speyer, and Sturmfels.

Talks Given

- **Tropical linear spaces** Fall 2015
  UGA Tropical Geometry VRG
- **The tropical Grassmannian** Fall 2015
  UGA Tropical Geometry VRG
- **Asymptotically good families** Spring 2015
  UGA Graduate Student Seminar
- **Determinental complexity of the permanent** Spring 2015
  UGA Student Algebraic Geometry Seminar
- **Construction of Grassmannian for Schubert calculus** Fall 2014
  UGA Schubert Calculus on Grassmannian VRG
- **Computability with an eye towards elliptic curves** Fall 2014
  Elliptic Curves Discussion Section

Conferences, Summer Schools, and Workshops Attended

- **Character Theory and the McKay Conjecture Summer School** Summer 2016
  Mathematical Sciences Research Institute
- **Southeastern Lie Theory Workshop** Summer 2016
  University of Virginia
- **Hodge Theory in Combinatorics Mini-Conference** Spring 2016
  Georgia Institute of Technology
- **Georgia Algebraic Geometry Symposium** Fall 2015
  Georgia Intstitute of Technology
- **Discrete Mathematics and Algorithms** Fall 2015
  Clemson University Mini-Conference
- **Georgia Algebraic Geometry Symposium** Fall 2014
  University of Georgia
- **Algebraic Geometry Northeastern Series** Fall 2014
  University of Pennsylvania

Service

- **Graduate Visitation Day Organizer** Spring 2016
  UGA Department of Mathematics
- **President** Spring 2016
  Secretary Fall 2015
  UGA Chapter of the American Mathematical Society
- **Logistic Organizer** Fall 2014 – Spring 2015
  Student Algebraic Geometry Seminar

Graduate Coursework

- **University of Georgia:** Elliptic Curves, Varieties, Schemes, Algebraic Curves, Sheaves and Cohomology, Flag Varieties, Lie Algebras, Toric Varieties, Complex Multiplication, Central Simple Algebras, Schubert Calculus VRG, Tropical Geometry VRG.
- **University of Massachusetts:** Algebra I & II, Real Analysis I & II, Complex Analysis, Topology, Manifolds I & II, Asymptotic Problems, Algebraic Number Theory, Theory of Computation.

Teaching History

- **Upward Bound:** SAT / ACT Math Teacher — Summer 2014, Upward Bound Summer Program
- **Math 300:** Introduction to Proofs Teaching Assistant — Fall 2013 – Spring 2014, University of Massachusetts
- **Math 127 & 128:** Calculus I & II Teaching Assistant — Fall 2011 – Spring 2013, University of Massachusetts
- **Math 235:** Linear Algebra Supplemental Instruction Leader — Fall 2011 – Spring 2012, University of Massachusetts

Computer Skills

- **General Programming:** Java and Python.
- **Mathematical Programming:** Sage, Pari/GP, and Magma, R.
- **Scripting Languages:** Perl, `bash`.
- **Markup:** LaTeX, `org-mode`, and HTML.
- **Operating Systems:** Windows, Mac OS, GNU/Linux.