# 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

## Employment

**Fordham University** — Aug. 2019 - Present
*Assistant Professor (tenure-track)*

**University of South Carolina** — Aug. 2016 - June 2019
*Visiting Research Assistant Professor*

**University of Georgia** — June 2010- May 2016
*Graduate Research and Teaching Assistant*

## Research Interests

Algebra and algebraic geometry: algebraic $K$-theory, derived categories, algebraic cycles, motives and motivic cohomology, central simple algebras, algebraic groups, homogeneous and toric varieties, Galois cohomology, and categorical approaches to metric and geometric topology.

## Publications

1. (with T. Needham) Interleaving distances, monoidal actions and 2-categories. arXiv:2311.11936, to appear in *Algebr. Geom. Topol.*
2. (with M. R. Ballard, A. Duncan, and A. Lamarche) Separable algebras and coflasque resolutions. *Adv. Math.* 444 (2024), Paper No. 109596.

3. (with L. Ji, S. Li, D. Moore, and M. Stevenson) Weil restriction of schemes and beyond. In P. Belmans, W. Ho, & A. De Jong (Eds.), *Stacks Project Expository Collection* (London Mathematical Society Lecture Notes Series, pp. 194-221, 2022). Cambridge: Cambridge University Press.
4. A.T.V.'s for (geometric) off-roading: a gentle introduction to arithmetic toric varieties. *Notices Amer. Math. Soc.* 69 (2022), no. 7, 1113–1125.
5. (with M. R. Ballard and A. Duncan) Derived categories of centrally-symmetric smooth toric Fano varieties. *Math. Nachr.* 295 (2022), no. 2, 218–241.
6. (with M. R. Ballard, N. K. Chidambaram, D. Favero, and R. R. Vandermolen) Kernels for Grassmann flops. *J. Math. Pures Appl.* (9) 147 (2021), 29-59.
7. (with M. R. Ballard and A. Duncan) On derived categories of arithmetic toric varieties. *Ann. K-Theory* 4 (2019), no. 2, 211-242.
8. Zero-cycles with coefficients for the second generalized symplectic involution variety of an algebra of degree 4, *J. Pure Appl. Algebra*, 223 (2019), no. 7, 2822-2830.
9. (with M. R. Ballard and A. Duncan) The toric Frobenius morphism and a conjecture of Orlov, *Eur. J. Math.* 5 (2019), no. 3, 640-645.
10. The group of $K_1$-zero-cycles on the second generalized Severi-Brauer variety of an algebra of index 4. *J. Algebra* 479 (2017), 192-202.
11. (with V. Alexeev, et al.) Extended Torelli map to the Igusa blowup in genus 6, 7, and 8. *Exp. Math.* 21 (2012), no. 2, 193-203.

**Submitted articles and preprints**

12. (with M. R. Ballard, A. Duncan, and A. Lamarche) Consequences of the existence of exceptional collections in arithmetic and rationality. arXiv:2009.10175, submitted 2023.
13. (with N. A. Castro and J. Joseph) Relative group trisections. arXiv:2406.14530, submitted 2024.

**Physics and Astronomy Research**

14. (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.
15. (with E. J. Rhodes, et al.) Temporal changes in the frequencies of the solar p-mode oscillations during solar cycle 23. Proceedings of the IAU, Vol. 6, Symposium S273, pp. 389-393, 2011.

## Grant Proposals and Awards

**FRG: Combinatorial approach to Bondal's Conjecture (Award: $5,500)** 2023-2024
*Fordham University*

**Academic Year Faculty Fellowship** Spring 2023
*Fordham University*

**PIC Math Program (Award: $6,000)** Summer 2021-Summer 2022
*Mathematical Association of America*

**Fordham A&S Deans' Challenge Grant (Award: $9,500)** Spring 2021
*Enhancing the Flipped-Hybrid Approach, Leader: Melkana Brakalova*

**Fordham A&S Deans' Challenge Grant (Award: $10,000)** Fall 2020
*Flipped-Hybrid Approach to Math Instruction, Leader: Melkana Brakalova*

**AMS–Simons Travel Grant (Award: $4,000)** July 2018–June 2021
*American Mathematical Society and the Simons Foundation*

**Great Lakes National Scholarship** Aug. 2015
*Great Lakes Educational Loan Services*

**Outstanding Teaching Assistant** March 2015
*University of Georgia*

**VIGRE Graduate Fellowship** Aug. 2011–July 2012
*National Science Foundation*

## Selected Talks

**Categorical approaches to interleaving distance** Nov. 2024
*Algebra Seminar, Fordham University*

**Coflasque resolutions, torsors, and rationality** April 2024
*AMS Central Sectional Meeting, University of Wisconsin, Milwaukee*

**Galois cohomology and limitations of the derived category** April 2024
*AGNT Seminar, Rice University*

**Fundamentals of groups of loops** April 2024
*Undergraduate Colloquium, Rice University*

**(Co)flasque resolutions and Brauer indistinguishability** March 2024
*AMS Southeastern Sectional Meeting, Florida State University*

**Analogues of simplicial/singular homology for schemes** Feb. 2024
*Algebra Seminar, Fordham University*

**Tori, toric varieties, and $K$-theory** Oct. 2023
*Algebra Seminar, Fordham University*

**Derived categories and rationality of twisted forms** Nov. 2021
*Derived, Birational, and Categorical Algebraic Geometry, BIRS*

**Ciphers, cryptography, and modular arithmetic** March 2021
*Mobile Math Circle, University of South Alabama*

**Separable algebras and rationality of arithmetic toric varieties** Feb. 2021
*Algebra Seminar, Rutgers University*

**Derived categories and rationality of twisted forms of toric varieties** Jan. 2021
*JMM Special Session on Galois Cohomology and Arithmetic Geometry*

**Algebraic groups, torsors, and twisted forms** Jan. 2020
*Lincoln Center Math Seminar, Fordham University*

**Twisted forms of toric varieties, their derived categories, and rationality** Nov. 2019
*Brauer Groups, Derived Categories and Birational Geometry, BIRS*

**Arithmetic and geometry of algebraic cycles** Oct. 2019
*Lincoln Center Math Seminar, Fordham University*

**Resolutions of tori and derived categories of toric varieties** Sept. 2019
*Emerging Research in Alg. Groups, Motives, and K-Theory, St. Petersburg, Russia*

**Toric varieties and their derived categories** Feb. 2019
*Mathematics Department Colloquium, Georgia Southern University*

**Geometric study of subfields of some non-commutative algebras** Nov. 2018
*Carolina Math Seminar, University of South Carolina*

**Algebraic cycles on homogeneous varieties** Oct. 2018
*Algebra, Geometry, and Number Theory Seminar, Tufts University*

**Galois descent for exceptional collections on toric varieties** Sept. 2018
*Algebra Seminar, University of Tennessee, Knoxville*

**Exceptional collections on some arithmetic toric varieties** July 2018
*K-theory Conference Workshop, Universidad de Buenos Aires*

**Derived categories of arithmetic toric varieties** June 2018
*The $13^{th}$ Brauer Group Conference, Pingree Park, CO*

**Introduction to Algebraic Cycles** Feb. 2018
*Motives Seminar, University of South Carolina*

**Exceptional collections on toric varieties** Nov. 2017
*Algebraic Geometry Seminar, University of South Carolina*

**Lectures on non-commutative motives** May–June 2017
*K-theory and related fields trimester program, Hausdorff Institute*

**Chow groups with coefficients for some twisted homogeneous varieties** March 2017
*Algebraic Geometry Seminar, Courant Institute of Mathematical Sciences*

**$K_1$-zero-cycles for some homogeneous varieties of type $\mathsf{A}_n$ and $\mathsf{C}_n$** March 2017
*Algebra Seminar, University of Alberta*

**Zero-cycles with coefficients for some twisted homogeneous varieties** March 2017
*Georgia Algebraic Geometry Symposium, University of Georgia*

**$K_1$-zero-cycles on twisted Grassmannians** Sept. 2016
*Topological Approaches to Arithmetic and Algebraic Geometry, University of Georgia*

**Chow groups with coefficients and generalized Severi-Brauer varieties** Feb. 2016
*Algebra and Number Theory Seminar, Emory University*

## Teaching and Training

**Fordham University**
*Instructor of Record*

- Math 1100–Finite Mathematics Spring 2025
- Math 1207–Calculus II Spring 2025
- Math 1100–Finite Mathematics (VIA) Fall 2024
- Math 1100–Finite Mathematics Fall 2024
- Math 1108–Math for Business: Finite Fall 2024
- Math 1100–Finite Mathematics Spring 2024
- Math 3005–Abstract Algebra Spring 2024
- Math 1100–Finite Mathematics (2 sections) Fall 2023
- Math 2006–Linear Algebra Fall 2023

· Math 1206–Calculus I — Summer 2022
· Math 3005–Abstract Algebra — Spring 2022
· Math 4002–Preparation for Industrial Careers in Math — Spring 2022
· Math 1100–Finite Mathematics (2 sections) — Fall 2021
· Math 3002–Differential Equations — Fall 2021
· Math 3005–Abstract Algebra — Summer 2021
· Math 3005–Abstract Algebra — Spring 2021
· Math 2004–Multivariable Calculus I (2 sections) — Fall 2020
· Math 3002–Differential Equations — Fall 2020
· Math 1203–Applied Calculus — Spring 2020
· Math 1205–Applied Statistics — Spring 2020
· Math 1100–Finite Mathematics (VIA) — Fall 2019
· Math 1108–Math for Business: Finite — Fall 2019

*Recitation Instructor*

· Math 2005–Multivariable Calculus II — Spring 2022
· Math 2005–Multivariable Calculus II — Spring 2021

**University of South Carolina**
*Instructor of Record*

· Math 599–Abstract Algebra and Music — Fall 2018
· Math 544–Linear Algebra — Spring 2018
· Math 142–Calculus I (2 sections) — Fall 2017
· Math 747–Algebraic Geometry: Schemes — Spring 2017
· Math 242–Elementary Differential Equations (2 sections) — Fall 2016

**University of Georgia**
*Instructor of Record*

· Math 2260–Calculus II for Science and Engineering — Fall 2015
· Math 1113–Pre-Calculus — Spring 2015
· Math 2250–Calculus I for Science and Engineering — Spring 2014
· Math 1113–Pre-Calculus — Fall 2013

*Recitation Instructor*

· Math 2200–Analytic Geometry and Calculus — Spring 2011
· Math 2200–Analytic Geometry and Calculus — Fall 2010

**Instructor for Math Kangaroo Course Level 3-4** — Fall 2022
*Math Kangaroo USA*

**Instructor for independent tutorial course on ring theory** — Summer 2021
*Students: F. Azad, Z. Chen, Z. van Zant*

**Mental Health and International Students** — Nov. 2018
*International Accelerator Program, University of South Carolina*

**FLIP (Focus on Learning, Innovation and Pedagogy) Participant** — Fall 2017
*Center for Teaching Excellence, University of South Carolina*

**Observer of first-time graduate instructors** Spring 2015
*University of Georgia, supervised by Lisa Townsley*

**UGA graduate student teacher training** 2010- 2014
*Courses with Robert Rumley, Jon Hanke, Matt Mastin, and Lisa Townsley*

## Professional Activities

**MoMath Math Gym Host** May 2020–Present
*National Museum of Mathematics, New York, NY*

**Faculty Advisor for the 3-2 Combined Engineering Program** Fall 2024–Present
*Fordham University*

**Faculty Advisor for Math-CISC Major** Fall 2019–Present
*Fordham University*

**Journal Referee** 2017–Present
- *Épijournal de Géométrie Algébrique*
- *Journal of Algebra*
- *Journal of the European Mathematical Society*
- *Notices of the American Mathematical Society*
- *Pacific Journal of Mathematics*

**Member of the Website Committee** Fall 2024–Present
*Department of Mathematics, Fordham University*

**Member of the Major Assessment Committee** Fall 2024
*Department of Mathematics, Fordham University*

**Member of the Special Projects Committee** Fall 2022–Spring 2024
*National Association of Mathematicians*

**Faculty Development Retreat** May 2024
*Fordham University*

**Core Curriculum Committee** Fall 2020–Spring 2023
*Fordham University*

**Math Kangaroo State Directors Meeting** Oct. 2022
*Math Kangaroo USA*

**Seminar on the Future of Jesuit Higher Education** Fall 2022
*Fordham University*

**AMS-SMF-EMS Special Session on Derived Cat. and Rationality** July 2022
*Co-organizer with M. Ballard and E. Macrì; Grenoble, France*

**Early-Career Faculty Panelist** Aug. 2021
*New Faculty Orientation, Fordham University*

**Career Day Volunteer** Jan. 2020
*The Equity Project Charter School*

**New Faculty Seminar on Mission** Fall 2019
*Fordham University*

**New Beginnings Life Skills Program Volunteer** Fall 2018–Summer 2019
*South Carolina Department of Juvenile Justice*

**Magellan Explorer Project Advisor** Spring 2017–Spring 2018
*for Danielle Wood, University of South Carolina*

**Top Scholar Review Committee Member and Interviewer** Fall 2017–Spring 2018
*University of South Carolina*

**Motives at South Carolina** Spring 2018
*Seminar Organizer*

**Comprehensive Exam Committee Member** Spring 2017–Fall 2018
*University of South Carolina*

- Candace Bethea
- Tracy Huggins
- Alicia Lamarche
- Robert Vandermolen

**South Carolina 4 Square Club (SC4SC)** Fall 2017–Spring 2019
*Club Advisor*

**USC Graduate Student Seminar** April 2019
*Job Market Panelist* Sept. 2017

**UGA conference on algebraic and analytic aspects of quadratic forms** July 2017
*Co-organizer with D. Krashen, P. Clark, and K. Thompson*

**University of South Carolina High School Math Competition** Feb. 2017
*Volunteer Judge and Proctor* Feb. 2018

**UGA Graduate Student Bootcamp** June 2016
*Job Market Panelist/Speaker on "How to give a good math talk"*

**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** Nov. 2014
*Volunteer* Nov. 2013

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

**Member of the American Mathematical Society**

**Member of the National Association of Mathematicians**

## Skills

### Technology

Self-instructed coding in Python, HTML, website building, Mathematica, Sage, Git, LaTeX, MyMathLab, MyLab Math, WebAssign, WebWork, BlackBoard, experience with Windows, Mac, Linux (via Ubuntu) operating systems.

### Language

- French, limited working proficiency
- Spanish, elementary proficiency

## Conferences and Workshops Attended

**Special Session on ramification in algebraic and arithmetic geometry** April 2024
*AMS Central Sectional Meeting, University of Wisconsin, Milwaukee*

**Special Session on algebraic groups and local-global principles** March 2024
*AMS Southeastern Sectional Meeting, Florida State University*

**Syzygies and Mirror Symmetry** Sept. 2023
*American Institute of Mathematics, Pasadena, CA*

**MAA MathFest** Aug. 2022
*Philadelphia, PA*

**Derived, Birational, and Categorical Algebraic Geometry** Nov. 2021
*Banff International Research Station, Banff, AB, Canada*

**Undergraduate Faculty Program on Motivic Milnor Numbers** Aug. 2021
*Park City Math Institute and Institute for Advanced Study*

**Quadratic forms, linear algebraic groups and beyond** May 2020-July 2022
*Organizers: P. Gille, Z. Reichstein, K. Zainoulline*

**Algebraic groups and algebraic geometry** June 2021
*In honor of Zinovy Reichstein's 60th birthday*

**PIC Math Faculty Workshop** June 2021
*Mathematical Association of America*

**Algebra and Geometry of Homogeneous Spaces** June 2021
*Organizers: N. Karpenko, N. Lemire, K. Zaynullin*

**Joint Mathematics Meetings** Jan. 2021
*Washington, D.C.*

**Derived categories and (non)commutative algebraic geometry** Dec. 2020
*Canadian Mathematical Society Winter Meeting*

**Birational, categorical, and derived algebraic geometry** Nov. 2020
*Banff International Research Station, Banff, AB, Canada*

**Madison Moduli Weekend** Sept. 2020
*University of Wisconsin, Madison*

**Workshop on $\infty$-categories and applications** Aug. 2020
*Max Planck Institute for Mathematics*

**Online Inquiry Based Learning** July 2020
*Mathematical Association of America*

**Electronic Algebraic K-Theory Seminar** June 2020
*Organizers: B. Antieau, E. Elmanto, A. Mathew, M. Yakerson*

**Teaching as a legitimate application of college mathematics** May 2020
*META Math Webinar, Mathematical Association of America*

**Brauer Groups, Derived Categories and Birational Geometry** Nov. 2019
*Banff International Research Station, Banff, AB, Canada*

**Emerging Research in Algebraic Groups, Motives, and K-Theory** Sept. 2019
*Euler International Mathematical Institute, St. Petersburg, Russia*

**Rationality problems in algebraic geometry** July 2019
*American Institute of Mathematics, San Jose, CA*

**Derived algebraic geometry and its applications** March 2019
*Mathematical Sciences Research Institute, Berkeley, CA*

**Joint Mathematics Meetings** Jan. 2019
*Baltimore, MD*

**Carolina Math Seminar** Nov. 2018
*University of South Carolina*

**$K$-theory Conference Workshop (ICM Satellite)** July 2018
*Universidad de Buenos Aires, Argentina*

**$K$-theory Conference School (ICM Satellite)** July 2018
*Universidad Nacional de La Plata, Argentina*

**The 13$^{\text{th}}$ Brauer Group Conference** June 2018
*Colorado State Mountain Campus, Pingree Park, CO*

**Discover USC** April 2018
*Mentor for Danielle Wood, University of South Carolina*

**A Day of Algebraic Geometry in Savannah** March 2018
*Georgia Southern University*

**Georgia Algebraic Geometry Symposium** Feb. 2018
*Georgia Institute of Technology*

**Joint Mathematics Meetings** Jan. 2018
*San Diego, CA*

**Stacks Project Workshop** July-Aug. 2017
*University of Michigan*

**CAAATQuaFs (Conference on Quadratic Forms)** July 2017
*University of Georgia*

**$K$-theory and Related Fields Trimester Program** May-June 2017
*Hausdorff Research Institute for Mathematics*

**Georgia Algebraic Geometry Symposium** March 2017
*University of Georgia*

**Lectures in Arithmetic Geometry at Rice** Feb. 2017
*Rice University*

**Topological Approaches to Arithmetic and Algebraic Geometry** Sept. 2016
*University of Georgia*

**Arithmetic Algebraic Geometry** Aug. 2016
*Courant Institute of Mathematical Sciences*

**Joint Mathematics Meetings** Jan. 2016
*Seattle, WA*

**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 12$^{\text{th}}$ Brauer Group Conference** June 2015
*Colorado State Mountain Campus, 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*