

# Patrick K. McFaddin

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## Education

### Ph.D., Mathematics

*University of Georgia*

May 2016

Athens, GA

- Advisor: Daniel Krashen
- Dissertation:  $K$ -cohomology of generalized Severi-Brauer varieties

### M.A., Mathematics

*University of Georgia*

August 2011

Athens, GA

- Advisor: Robert Varley

### B.A., with Honors in Mathematics

*University of Southern California*

May 2010

Los Angeles, CA

## Employment

### Fordham University

*Assistant Professor (tenure-track)*

Aug. 2019 - Present

### University of South Carolina

*Visiting Research Assistant Professor*

Aug. 2016 - June 2019

### University of Georgia

*Graduate Research and Teaching Assistant*

June 2010- May 2016

## 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, categorical methods in data analysis.

## Publications

1. (with M. Ballard, A. Duncan, A. Lamarche) Separable algebras and coflasque resolutions. arXiv:2006.06876, to appear in *Adv. Math.*
2. (with L. Ji, S. Li, D. Moore, 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.

Last updated April 22, 2024

3. 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.
4. (with M. Ballard and A. Duncan) Derived categories of centrally-symmetric smooth toric Fano varieties. *Math. Nachr.* 295 (2022), no. 2, 218–241.
5. (with M. Ballard, N. Chidambaram, D. Favero, and R. Vandermolen) Kernels for Grassmann flops. *J. Math. Pures Appl.* (9) 147 (2021), 29–59.
6. (with M. Ballard and A. Duncan) On derived categories of arithmetic toric varieties. *Ann. K-Theory* 4 (2019), no. 2, 211–242.
7. 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.
8. (with M. Ballard and A. Duncan) The toric Frobenius morphism and a conjecture of Orlov, *Eur. J. Math.* 5 (2019), no. 3, 640–645.
9. 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.
10. (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

11. (with M. Ballard, A. Duncan, A. Lamarche) Consequences of the existence of exceptional collections in arithmetic and rationality. arXiv:2009.10175, submitted 2023.
12. (with T. Needham) Interleaving distances, monoidal actions and 2-categories. arXiv:2311.11936, submitted 2023.

#### Physics and Astronomy Research

13. (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.
14. (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.

#### Awards

<b>Faculty Research Grant (Award: \$5,500)</b> <i>Fordham University</i>	2023-2024
<b>Academic Year Faculty Fellowship</b> <i>Fordham University</i>	Spring 2023
<b>PIC Math Program (Award: \$6,000)</b> <i>Mathematical Association of America</i>	Summer 2021-Summer 2022
<b>Fordham A&amp;S Deans' Challenge Grant (Award: \$9,500)</b> <i>Enhancing the Flipped-Hybrid Approach, Grant Leader: Melkana Brakalova</i>	Spring 2021
<b>Fordham A&amp;S Deans' Challenge Grant (Award: \$10,000)</b> <i>Flipped-Hybrid Approach to Math Instruction, Grant Leader: Melkana Brakalova</i>	Fall 2020
<b>AMS–Simons Travel Grant (Award: \$4,000)</b> <i>American Mathematical Society and the Simons Foundation</i>	July 2018–June 2021

**Great Lakes National Scholarship**  
*Great Lakes Educational Loan Services*

Aug. 2015

**Outstanding Teaching Assistant**  
*University of Georgia*

March 2015

**VIGRE Graduate Fellowship**  
*National Science Foundation*

Aug. 2011–July 2012

## Selected Talks

**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*

<b>Algebraic cycles on homogeneous varieties</b> <i>Algebra, Geometry, and Number Theory Seminar, Tufts University</i>	Oct. 2018
<b>Galois descent for exceptional collections on toric varieties</b> <i>Algebra Seminar, University of Tennessee, Knoxville</i>	Sept. 2018
<b>Exceptional collections on some arithmetic toric varieties</b> <i>K-theory Conference Workshop, Universidad de Buenos Aires</i>	July 2018
<b>Derived categories of arithmetic toric varieties</b> <i>The 13<sup>th</sup> Brauer Group Conference, Pingree Park, CO</i>	June 2018
<b>Introduction to Algebraic Cycles</b> <i>Motives Seminar, University of South Carolina</i>	Feb. 2018
<b>Exceptional collections on toric varieties</b> <i>Algebraic Geometry Seminar, University of South Carolina</i>	Nov. 2017
<b>Lectures on non-commutative motives</b> <i>K-theory and related fields trimester program, Hausdorff Institute</i>	May–June 2017
<b>Chow groups with coefficients for some twisted homogeneous varieties</b> <i>Algebraic Geometry Seminar, Courant Institute of Mathematical Sciences</i>	March 2017
<b><math>K_1</math>-zero-cycles for some homogeneous varieties of type <math>A_n</math> and <math>C_n</math></b> <i>Algebra Seminar, University of Alberta</i>	March 2017
<b>Zero-cycles with coefficients for some twisted homogeneous varieties</b> <i>Georgia Algebraic Geometry Symposium, University of Georgia</i>	March 2017
<b><math>K_1</math>-zero-cycles on twisted Grassmannians</b> <i>Topological Approaches to Arithmetic and Algebraic Geometry, University of Georgia</i>	Sept. 2016
<b>Chow groups with coefficients and generalized Severi-Brauer varieties</b> <i>Algebra and Number Theory Seminar, Emory University</i>	Feb. 2016

## Teaching and Training

### Fordham University

#### *Instructor of Record*

· Math 3005–Abstract Algebra	Spring 2024
· Math 1100–Finite Mathematics	Spring 2024
· Math 2006–Linear Algebra	Fall 2023
· Math 1100–Finite Mathematics (2 sections)	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	Fall 2019
· Math 1108–Math for Business: Finite	Fall 2019
<i>Recitation Instructor</i>	
· Math 2005–Multivariable Calculus II	Spring 2022
· Math 2005–Multivariable Calculus II	Spring 2021
<b>University of South Carolina</b>	
<i>Instructor of Record</i>	
· 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
<b>University of Georgia</b>	
<i>Instructor of Record</i>	
· 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
<i>Recitation Instructor</i>	
· Math 2200–Analytic Geometry and Calculus	Spring 2011
	Fall 2010
<b>Instructor for Math Kangaroo Course Level 3-4</b>	Fall 2022
<i>Math Kangaroo USA</i>	
<b>Instructor for independent tutorial course on ring theory</b>	Summer 2021
<i>Students: F. Azad, Z. Chen, Z. van Zant</i>	
<b>Mental Health and International Students</b>	Nov. 2018
<i>International Accelerator Program, University of South Carolina</i>	
<b>FLIP (Focus on Learning, Innovation and Pedagogy) Participant</b>	Fall 2017
<i>Center for Teaching Excellence, University of South Carolina</i>	
<b>Observer of first-time graduate instructors</b>	Spring 2015
<i>University of Georgia, supervised by Lisa Townsley</i>	
<b>UGA graduate student teacher training</b>	2010- 2014
<i>Courses with Robert Rumley, Jon Hanke, Matt Mastin, and Lisa Townsley</i>	

## Professional Activities

<b>MoMath Math Gym Host</b>	May 2020–Present
<i>National Museum of Mathematics, New York, NY</i>	
<b>Faculty Advisor for Math-CISC Major</b>	Fall 2019–Present
<i>Fordham University</i>	

<b>Core Curriculum Committee</b> <i>Fordham University</i>	Nov. 2020–Present
<b>Member of the Special Projects Committee</b> <i>National Association of Mathematicians</i>	Fall 2022–Spring 2024
<b>Math Kangaroo State Directors Meeting</b> <i>Math Kangaroo USA</i>	Oct. 2022
<b>Seminar on the Future of Jesuit Higher Education</b> <i>Fordham University</i>	Fall 2022
<b>AMS-SMF-EMS Special Session on Derived Cat. and Rationality</b> <i>Co-organizer with M. Ballard and E. Macrì; Grenoble, France</i>	July 2022
<b>Early-Career Faculty Panelist</b> <i>New Faculty Orientation, Fordham University</i>	Aug. 2021
<b>Career Day Volunteer</b> <i>The Equity Project Charter School</i>	Jan. 2020
<b>New Faculty Seminar on Mission</b> <i>Fordham University</i>	Fall 2019
<b>New Beginnings Life Skills Program Volunteer</b> <i>South Carolina Department of Juvenile Justice</i>	Fall 2018–Summer 2019
<b>Magellan Explorer Project Advisor</b> <i>for Danielle Wood, University of South Carolina</i>	Spring 2017–Spring 2018
<b>Top Scholar Review Committee Member and Interviewer</b> <i>University of South Carolina</i>	Fall 2017–Spring 2018
<b>Motives at South Carolina</b> <i>Seminar Organizer</i>	Spring 2018
<b>Comprehensive Exam Committee Member</b> <i>University of South Carolina</i>	Spring 2017–Fall 2018
<ul style="list-style-type: none"> <li>· Candace Bethea</li> <li>· Tracy Huggins</li> <li>· Alicia Lamarche</li> <li>· Robert Vandermolen</li> </ul>	
<b>Journal Referee</b>	2017–Present
<ul style="list-style-type: none"> <li>· <i>Pacific Journal of Mathematics</i></li> <li>· <i>Journal of the European Mathematical Society</i></li> <li>· <i>Épjournal de Géométrie Algébrique</i></li> </ul>	
<b>South Carolina 4 Square Club (SC4SC)</b> <i>Club Advisor</i>	Fall 2017–Spring 2019
<b>USC Graduate Student Seminar</b> <i>Job Market Panelist</i>	April 2019 Sept. 2017
<b>UGA conference on algebraic and analytic aspects of quadratic forms</b> <i>Co-organizer with D. Krashen, P. Clark, and K. Thompson</i>	July 2017

<b>University of South Carolina High School Math Competition</b>	Feb. 2017
<i>Volunteer Judge and Proctor</i>	Feb. 2018
<b>UGA Graduate Student Bootcamp</b>	June 2016
<i>Job Market Panelist/Speaker on “How to give a good math talk”</i>	
<b>University of Georgia Math Camp</b>	June 2016
<i>Graduate Instructor</i>	July 2014
<b>Project REFOCUS</b>	Spring 2016
<i>21st Century Skills Program Volunteer</i>	Fall 2015
<b>University of Georgia High School Math Tournament</b>	Nov. 2014
<i>Volunteer</i>	Nov. 2013
<b>A Place Called Home Non-Profit Youth Center</b>	Spring 2008
<i>Volunteer Tutor, K-12, all subjects</i>	
<b>Member of the American Mathematical Society</b>	
<b>Member of the National Association of Mathematicians</b>	

## Skills

### Technology

Self-instructed coding in Python, HTML, website building, Mathematica, Sage, Git, L<sup>A</sup>T<sub>E</sub>X, 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

<b>Special Session on ramification in algebraic and arithmetic geometry</b>	April 2024
<i>AMS Central Sectional Meeting, University of Wisconsin, Milwaukee</i>	
<b>Special Session on algebraic groups and local-global principles</b>	March 2024
<i>AMS Southeastern Sectional Meeting, Florida State University</i>	
<b>Szygies and Mirror Symmetry</b>	Sept. 2023
<i>American Institute of Mathematics, Pasadena, CA</i>	
<b>MAA MathFest</b>	Aug. 2022
<i>Philadelphia, PA</i>	
<b>Derived, Birational, and Categorical Algebraic Geometry</b>	Nov. 2021
<i>Banff International Research Station, Banff, AB, Canada</i>	
<b>Undergraduate Faculty Program on Motivic Milnor Numbers</b>	Aug. 2021
<i>Park City Math Institute and Institute for Advanced Study</i>	

<b>Quadratic forms, linear algebraic groups and beyond</b> <i>Organizers: P. Gille, Z. Reichstein, K. Zainoulline</i>	May 2020-July 2022
<b>Algebraic groups and algebraic geometry</b> <i>In honor of Zinovy Reichstein's 60th birthday</i>	June 2021
<b>PIC Math Faculty Workshop</b> <i>Mathematical Association of America</i>	June 2021
<b>Algebra and Geometry of Homogeneous Spaces</b> <i>Organizers: N. Karpenko, N. Lemire, K. Zaynullin</i>	June 2021
<b>Joint Mathematics Meetings</b> <i>Washington, D.C.</i>	Jan. 2021
<b>Derived categories and (non)commutative algebraic geometry</b> <i>Canadian Mathematical Society Winter Meeting</i>	Dec. 2020
<b>Birational, categorical, and derived algebraic geometry</b> <i>Banff International Research Station, Banff, AB, Canada</i>	Nov. 2020
<b>Madison Moduli Weekend</b> <i>University of Wisconsin, Madison</i>	Sept. 2020
<b>Workshop on <math>\infty</math>-categories and applications</b> <i>Max Planck Institute for Mathematics</i>	Aug. 2020
<b>Online Inquiry Based Learning</b> <i>Mathematical Association of America</i>	July 2020
<b>Electronic Algebraic K-Theory Seminar</b> <i>Organizers: B. Antieau, E. Elmanto, A. Mathew, M. Yakerson</i>	June 2020
<b>Teaching as a legitimate application of college mathematics</b> <i>META Math Webinar, Mathematical Association of America</i>	May 2020
<b>Brauer Groups, Derived Categories and Birational Geometry</b> <i>Banff International Research Station, Banff, AB, Canada</i>	Nov. 2019
<b>Emerging Research in Algebraic Groups, Motives, and K-Theory</b> <i>Euler International Mathematical Institute, St. Petersburg, Russia</i>	Sept. 2019
<b>Rationality problems in algebraic geometry</b> <i>American Institute of Mathematics, San Jose, CA</i>	July 2019
<b>Derived algebraic geometry and its applications</b> <i>Mathematical Sciences Research Institute, Berkeley, CA</i>	March 2019
<b>Joint Mathematics Meetings</b> <i>Baltimore, MD</i>	Jan. 2019
<b>Carolina Math Seminar</b> <i>University of South Carolina</i>	Nov. 2018
<b>K-theory Conference Workshop (ICM Satellite)</b> <i>Universidad de Buenos Aires, Argentina</i>	July 2018
<b>K-theory Conference School (ICM Satellite)</b> <i>Universidad Nacional de La Plata, Argentina</i>	July 2018
<b>The 13<sup>th</sup> Brauer Group Conference</b> <i>Colorado State Mountain Campus, Pingree Park, CO</i>	June 2018
<b>Discover USC</b> <i>Mentor for Danielle Wood, University of South Carolina</i>	April 2018



<b>A Day of Algebraic Geometry in Savannah</b> <i>Georgia Southern University</i>	March 2018
<b>Georgia Algebraic Geometry Symposium</b> <i>Georgia Institute of Technology</i>	Feb. 2018
<b>Joint Mathematics Meetings</b> <i>San Diego, CA</i>	Jan. 2018
<b>Stacks Project Workshop</b> <i>University of Michigan</i>	July-Aug. 2017
<b>CAAATQuaFs (Conference on Quadratic Forms)</b> <i>University of Georgia</i>	July 2017
<b>K-theory and Related Fields Trimester Program</b> <i>Hausdorff Research Institute for Mathematics</i>	May-June 2017
<b>Georgia Algebraic Geometry Symposium</b> <i>University of Georgia</i>	March 2017
<b>Lectures in Arithmetic Geometry at Rice</b> <i>Rice University</i>	Feb. 2017
<b>Topological Approaches to Arithmetic and Algebraic Geometry</b> <i>University of Georgia</i>	Sept. 2016
<b>Arithmetic Algebraic Geometry</b> <i>Courant Institute of Mathematical Sciences</i>	Aug. 2016
<b>Joint Mathematics Meetings</b> <i>Seattle, WA</i>	Jan. 2016
<b>Georgia Algebraic Geometry Symposium</b> <i>Emory University</i>	Oct. 2015
<b>Local-Global Principles and Their Obstructions</b> <i>University of Pennsylvania</i>	Oct. 2015
<b>Grad Student Bootcamp for the Alg. Geom. Research Institute</b> <i>University of Utah</i>	July 2015
<b>The 12<sup>th</sup> Brauer Group Conference</b> <i>Colorado State Mountain Campus, Pingree Park, CO</i>	June 2015
<b>Arizona Winter School: Arithmetic and Higher-Dimensional Varieties</b> <i>University of Arizona</i>	March 2015
<b>Georgia Algebraic Geometry Symposium</b> <i>University of Georgia</i>	Oct. 2014
<b>Representation Theory and K-Theory</b> <i>University of Southern California</i>	May 2014
<b>Southeastern Lie Theory Workshop</b> <i>University of Georgia</i>	May 2014
<b>Georgia Algebraic Geometry Symposium</b> <i>University of Georgia</i>	Oct. 2013
<b>Torsors, Nonassociative Algebras, and Cohomological Invariants</b> <i>Fields Institute</i>	June 2013
<b>Homotopical Methods in Algebraic Geometry</b> <i>University of Southern California</i>	May 2013

<b>Workshop on Torsors, Motives, and Cohomological Invariants</b> <i>Fields Institute</i>	May 2013
<b>Oberwolfach Seminar on Algebraic Groups and Patching</b> <i>Mathematisches Forschungsinstitut Oberwolfach</i>	Oct. 2012
<b>Georgia Algebraic Geometry Symposium</b> <i>University of Georgia</i>	May 2012
<b>VIGRE Summer School Program in Algebraic Geometry</b> <i>University of Georgia</i>	May 2012
<b>Arizona Winter School: Ramification and Geometry</b> <i>University of Arizona</i>	March 2012
<b>Algebraic Geometry Northeastern Series Workshop</b> <i>Stony Brook University</i>	Oct. 2011
<b>A Celebration of Algebraic Geometry</b> <i>Harvard University</i>	Aug. 2011
<b>K-Theory and Motives</b> <i>University of California, Los Angeles</i>	March 2011
<b>Compact Moduli and Vector Bundles</b> <i>University of Georgia</i>	May 2010