Reza Akhtar

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Education

Ph.D. Mathematics, Brown University, 2000.
Dissertation title: *Milnor K-theory and zero-cycles on algebraic varieties.*
Dissertation advisor: Stephen Lichtenbaum

Sc.M. Mathematics, Brown University, 1997.

S.M. Applied Mathematics, Harvard University, 1995.

A.B. Mathematics *magna cum laude*, Harvard University, 1995.

Employment

Professor (with tenure), Miami University, July 2012 - present.

Associate Professor (with tenure), Miami University, July 2006 - June 2012.

Assistant Professor, Miami University, Sept. 2000 - June 2006.

Research Interests

My dissertation and most of my early papers are in the area of algebraic geometry, more specifically algebraic cycles and motives. Most of the rest of my work involves problems at the intersection of algebra and combinatorics.

Research Publications

R. Akhtar and S. R. Arvind. On the distribution of the greatest common divisor for number fields. In preparation.

R. Akhtar and S. Gagola III. Strong complete mappings for 3-groups. In preparation.

R. Akhtar and R. Joshua. Explicit Chow-Lefschetz decompositions of Kummer manifolds. K-theory: Proc. of the International Colloquium, Mumbai, 2016. Hindustan Book Agency (2018), 155-194.

R. Akhtar. Symmetric linear operator identities in quaisgroups. *Comment. Math. Univ. Carolinae* **58** (2017), no. 4, 401-417.

R. Akhtar. On generalized associativity in groupoids. *Quasigroups and Related Systems* **24** (2016), 1-6.

R. Akhtar and L. Lee. Connectivity of the zero-divisor graph for finite rings. *Involve* **9** (2016), no. 3, 415-422.

R. Akhtar, B. Burns, H. Hoganson, H. Mansfield, O. Sobieska, and Z. Woods. Splitting techniques and the Betti numbers of secant powers. *Involve* **9** (2016), no. 5, 737-750.

R. Akhtar and M. Forlini. The Linear Chromatic Number of a Sperner Family. *Discrete Applied Mathematics* **171** (2014), 1-8.

R. Akhtar, A. B. Evans, and D. Pritikin. Representation Numbers of Complete Multipartite Graphs. *Discrete Mathematics* **3112** (2012), 1158-1165.

R. Akhtar, A. Arp, M. Kaminski, J. VanExel, D. Vernon, and C. Washington. The varieties of Bol-Moufang quasigroups defined by a single operation. *Quasigroups and Related Systems* **20** (2012), 1-10.

R. Akhtar. Representation Numbers of Some Sparse Graphs. *Discrete Mathematics* **312** (2012), no. 22, 3417-3423.

R. Akhtar and R. Joshua. Toric Residue Codes: I. *Finite Fields and their Applications* **17** (2011), no. 1, 15-50.

R. Akhtar and P. Larson. Small-sum pairs in abelian groups. *J. de Th. des Nombres de Bordeaux* **22** (2010), no.3, 525-535.

R. Akhtar, A. B. Evans, and D. Pritikin. Representation Numbers of Stars. *Integers* **10** (2010), 733-745.

R. Akhtar, M. Boggess, T. Jackson-Henderson, I. Jiménez, R. Karpman, A. Kinzel, and D. Pritikin. On the unitary Cayley graph of a finite ring. *Elec. J. of Combinatorics* **16** (2009), no. 1, Research Paper 117, 13 pp.

R. Akhtar and R. Joshua. Lefschetz Decompositions for Quotient Varieties. *Journal of K-theory* **3** (2009), no.3, 547-560.

R. Akhtar, T. Jiang, and Z. Miller. Asymptotic determination of edge-bandwidth of multidimensional grids and Hamming graphs. *SIAM J. on Discrete Mathematics* **22** (2008), no. 2., 425-449.

R. Akhtar, T. Jiang, and D. Pritikin. Edge-bandwidth of the triangular grid. *Elec. J. of Combinatorics* **14** (2007), no. 1, Research Paper 67, 11 pp.

R. Akhtar. A mod-ℓ vanishing theorem of Beilinson-Soulé type. *J. of Pure and Applied Algebra* **208** (2007), no. 2, 555-560.

R. Akhtar and L. Lee. Homology of zero-divisors. *Rocky Mountain J. of Mathematics* **37** (2007), no. 4, 1105-1126.

R. Akhtar and R. Joshua. Künneth decompositions for quotient varieties. *Indagationes Mathematicae* **17** (2006), no. 3, 319-344.

R. Akhtar. Cycles on curves over global fields of positive characteristic. *Trans. of the Amer. Math. Soc.* **357** (2005), 2557-2569.

R. Akhtar. Adequate equivalence relations and Pontryagin products. *J. of Pure and Applied Algebra* **196** (2005), no. 1, 21-37.

R. Akhtar. Milnor K-theory of smooth varieties. *K-theory* **32** (2004), no. 3, 269-291.

R. Akhtar. Torsion in mixed K-groups. *Communications in Algebra* **32** (2004), no. 1, 295-313.

R. Akhtar. Zero-cycles on varieties over finite fields. *Communications in Algebra* **32** (2004), no. 1, 279-294.

R. Akhtar and A. Lachlan. On countable homogeneous 3-graphs. *Archive for Mathematical Logic* **34** (1995), no. 5, 331-344.

Volume edited

(with P. Brosnan, R. Joshua, eds.) *The Geometry of Algebraic Cycles.* Papers from the 2nd Conference on Algebraic Cycles held at the Ohio State University, Columbus, OH. March 2529, 2008. Clay Mathematics Proceedings **9**.

Research Presentations

"Quasigroups, generalized associativity, and automatic theorem-proving": Colloquium, Wright State University. Fairborn, OH. November 2017.

"Betti numbers of secant powers of the edge ideal of a graph": MIGHTY LVII, Fairborn, OH. April 2016.

"Explicit motivic decompositions for Kummer varieties and manifolds": Seminar, Ohio State University. Columbus, OH. November 2015.

"Representation numbers of certain sparse graphs": MIGHTY LIV, Fort Wayne, IN. October 2014.

"Splitting techniques and the Betti numbers of secant ideals": Colloquium, Ohio State University. Columbus, OH. April 2014.

"Representation numbers of complete multipartite graphs": MIGHTY LII, Terre Haute, IN. April 2012.

"Bol-Moufang quasigroups defined by a single operation": SIDIM Meeting, Humacao, PR. February 2011.

"Small-sum pairs in abelian groups": CMS Winter Meeting, Vancouver, BC. December 2010.

"The Linear Chromatic Number of a Sperner Family": MIGHTY L, Superior, WI. October 2010.

"The zero-divisor graph: at the intersection of algebra and combinatorics": Colloquium, Butler University, Indianapolis, IN. October 2009.

"The Beilinson-Soulé Conjecture with finite coefficients": Algebraic Cycles Conference II, Columbus, OH. March 2008.

"Motivic decompositions for quotient varieties": Algebraic Geometry Seminar, The Ohio State University, March 2007.

"Chow-Künneth and Lefschetz Decompositions for Quotient Varieties": CMS Winter Meeting, Toronto, ON. December, 2006.

"Elliptic Curves, Arithmetic, and Geometry": Colloquium, Baldwin-Wallace College, November 2006.

"The zero-divisor graph: at the intersection of algebra and combinatorics": Undergraduate Seminar, Trinity University, September 2006.

"Combinatorial methods for studying zero-divisors": Colloquium, Trinity University, September 2006.

"Beyond the zero-divisor graph: a homology theory for zero-divisors": Colloquium, Wabash College, June 2006.

"Edge-bandwidth of the triangular grid": MIGHTY (Midwest Graph Theory) XLII: Marion, OH. April 29th, 2006.

"A vanishing theorem of Beilinson-Soulé type": K-theory Seminar, The Ohio State University, March 2006.

"Cycles, cohomology, and motives": Colloquium, Miami University, April 2005.

"Algebraic cycles on curves over global fields": Algebraic Geometry Seminar, The Ohio State University, April 2005.

"Algebraic Cycles on Abelian Varieties": Colloquium, Rose-Hulman Institute of Technology, November 2004.

"Elliptic Curves, Arithmetic and Geometry": Colloquium, Wabash College, March 2004.

"Cycle groups of curves over global fields of positive characteristic": Joint Mathematics Meetings. Phoenix, AZ. January 7th, 2004.

"Cycles on Algebraic Varieties": Colloquium, University of Dayton, October 2002.

"Adequate equivalence relations and cycles on abelian varieties": AMS Regional Meeting, Boston, MA. October 5-6, 2002.

"Kato-Somekawa groups and higher Chow groups of zero-cycles": AMS Regional Meeting, Columbus, OH. September 21 - 23, 2001.

"Milnor K-theory of smooth schemes": AMS Regional Meeting, Lawrence, KS. March 30 - April 1, 2001.

"Milnor K-theory and Intersection Theory": Colloquium, University of Cincinnati, January 2001

"Zero-cycles on algebraic varieties": Algebra Seminar, University of Pennsylvania, January 2000.

Courses taught

At Brown University

MTH 9, Calculus I, Summer 1998.

MTH 17, A.P. Calculus II, Fall 1998.

At Miami University

MTH 151, Calculus I: Fall 2000, Fall 2001, Fall 2005.

MTH 153, Calculus I: Fall 2009.

MTH 190, First Year Seminar in Mathematics and Statistics: Spring 2013, Fall 2013, Fall 2014.

MTH 222, Linear Algebra: Fall 2000, Fall 2007 (2 sec.), Spring 2013, Fall 2013, Fall 2014, Spring 2016, Spring 2017 (2 sec.).

MTH 231, Discrete Mathematics: Spring 2003, Spring 2005 (2 sec).

MTH 245, Differential Equations for Engineers: Spring 2010, Fall 2010, Fall 2011, Fall 2012, Fall 2015, Fall 2017, Spring 2018, Fall 2019.

MTH 247, Financial Mathematics for Actuaries. Spring 2015, Spring 2016.

MTH 249, A.P. Calculus II: Fall 2002, Fall 2003, Fall 2006, Fall 2013.

MTH 249H Honors A.P. Calculus II: Fall 2007, Fall 2012.

MTH 251, Calculus II: Spring 2001, Spring 2006, Fall 2008, Spring 2011, Summer 2017 (first third), Fall 2019.

MTH 252, Calculus III: Fall 2004, Spring 2007, Spring 2012, Spring 2014, Fall 2017, Fall 2018.

MTH 252H, Honors Calculus III: Spring 2008.

MTH 347, Differential Equations: Fall 2006.

MTH 420/520, Topics in Algebra: Spring 2004, Summer 2016.

MTH 421/521, Abstract Algebra I: Fall 2001, Spring 2003, Fall 2005, Spring 2007, Fall 2009, Fall 2011, Spring 2012, Fall 2014, Fall 2016, Fall 2018.

MTH 422/522, Abstract Algebra II: Spring 2001, Spring 2010.

MTH 425/525, Number Theory: Fall 2003, Fall 2004, Spring 2014.

MTH 447/547, Topics in Mathematical Finance: Spring 2011, Spring 2013, Fall 2016, Summer 2018.

MTH 620, Topics in Algebra: Summer 2003.

MTH 621, Graduate Algebra I: Fall 2002, Fall 2008, Fall 2010, Fall 2015.

MTH 622, Graduate Algebra II: Spring 2002, Spring 2006, Spring 2019.

Research Students

M.A. Thesis advisor for Jeffrey Cooper, August 2009 - April 2010. Thesis title: *Product dimension of a random graph.*

M.A. Thesis advisor for Daniel Baczkowski, August 2003 - July 2004. Thesis title: *Diophantine equations involving arithmetic functions of factorials.*

Master's final projects

Robyn Campbell (October 2018 - July 2019)

Emmanuel Tamakloe (January 2015 - October 2015)

Christine Stoller (January 2013 - August 2013)

Joshua Fitzgerald (January 2012 - August 2012)

Laura Hoffman (January 2011 - October 2011)

Cory Washington (January 2010 - January 2013)

Carmen Weddell (August 2009 - April 2010)

Joshua Wagner (August 2008 - June 2009)

Benjamin Byer (August 2006 - May 2007, left Miami before finishing)

Holly Attenborough (August 2005 - May 2006)

Melody Brickel (January - May 2004)

Deborah Puffer (January - May 2003)

Amy Herron (March - July 2002)

Graduate Independent Studies

Jacob Barahona-Kaamsvag, Anthony Wilkie, Michael Woode, Ruifeng Xu, Summer 2019.

Delaney Aydel, Summer 2017.

Robert Seiver, Fall 2009.

Undergraduate Independent Studies

Dylan Palo, Spring 2017.

Kara Ungerman, Fall 2013.

Jonathon Hall, Spring 2008.

Todd Van Woerkom, Fall 2007.

Undergraduate research students (individual)

S. Ram Arvind, Summer 2017.

Maxwell Forlini, Summer 2009.

Nathan St. John, Summer 2007.

Lucas Lee, Summer 2003.

Undergraduate SUMSRI research students

2013: Brittany Burns, Haley Mansfield, Ola Sobieska, Zerotti Woods.

2012: Rachel Aldrich, Sarah Drummond, Barbara Hernandez, Hannah Hoganson, Lauren Morey, Marco Tapia-Guilliams, Alicia Velek.

2011: Crystal Altamirano, Stephanie Angus, Lauren Brown, Laura Gioco, Joseph Crawford.

2010: Ashley Arp, Michael Kaminski, Jasmine Van Exel, Davian Vernon.

2009: Daniel Caproni, Joshua Edgerton, Margaret Rahmoeller, Mychael Sanchez, Anna Tracy.

2008: Megan Bernstein, Megan Boggess, Tiffany Jackson-Henderson, Isidora Jiménez, Rachel Karpman.

2007: Katherine Benson, Louis Cruz, Yesenia Cruz, Melissa Tolley, Bryant Watkins.

2006: Chantelle Bicket, Samantha Graffeo, Darragh Ross, Edward Washington.

2005: Camil Aponte, Natalia Córdova, Clyde Gholston, Helen Hauser, Patrice Johnson, Nathan Mims.

2004: Amanda Phillips, Julie Rogers, Kevin Tolliver, Frannie Worek.

Graduate Examinations

Algebra Comprehensive Examiner (many times since 2001).

Master's Final Exam Committee (2 thesis advisor, 12 non-thesis advisor, others as non-advisor)

Student Advising

I have served as academic advisor for between five and ten undergraduate students each year (B.S. in Mathematics) since 2003.

SUMSRI

For many years, I was affiliated with SUMSRI (Summer Undergraduate Mathematical Science Research Institute) at Miami University in various capacities: During 2002, 2003, and 2014, I was the Algebra Short Course instructor for the program. This involved giving 12-14 hours of lectures on the arithmetic of elliptic curves. From 2004 until 2013, I was the director of a research seminar in either Algebra or Discrete Mathematics. During the seven weeks of the program, I met with an assigned group of four to six students and supervised their research on a problem of my choosing. The students wrote up their results in a final paper and delivered a final presentation. In some cases, the results were submitted for publication in a research journal.

From 2009 through 2015 and in 2018, I served as Program Director (joint with Patrick Dowling in 2009-2013). This has involved writing the proposals for the grants, hiring faculty and staff for the program, selecting students, inviting colloquium speakers, and general oversight of the program while in session. In 2014, I was both Program Director and Coordinator. This involved the duties mentioned above, but also the responsibilities of payroll for employees, travel arrangements, and organization of various program events.

Service

Departmental Service

Associate Chair, Department of Mathematics, Fall 2016 - present.
Ongoing duties include designing and maintaining the department teaching schedule, managing student enrollment, and hearing academic dishonesty cases. I have also designed a research map for the department web page (Summer 2017), organized a department retreat (Fall 2017) and assembled an archive of course materials for the department (Spring - Summer 2019).

Oxford Mathematics Search Committees (Tenure-track): 2002-03, 2011-12, 2014-15, 2016-17.

Oxford Mathematics Search Committee (Lecturer): 2013-14.

Hamilton Mathematics Search Committee: 2009-10.

Governance Committee: 2017 - present, 2008-09, 2006-07.

Chair of Tenure Committee, Fall 2014 - Fall 2017.

Mathematics Committee Chair: 2006-08.

Mathematics Committee Secretary: 2002-06.

Library Liaison: 2004-06.

Colloquium Committee: 2003-04.

Online Teaching Evaluation Committee: Spring 2012, Fall 2013.

Chair of Committee for Peer Review of Teaching: 2005.

Computer Committee, Fall 2013 - present.

Graduate Committee: Fall 2001 - Spring 2004 and Fall 2007 - Spring 2014.

Maintainer of department web page: Spring 2009 - Spring 2014.

Minor work on department web page: Fall 2002 - Spring 2009.

Mathematics Steering Committee: Fall 2000 - Spring 2001.

Peer review of teaching for colleagues (6 reviews).

University Service

Honors and Scholars Program Advisory Committee: Fall 2007 - Spring 2010.

Graduate Council Natural Sciences Subcommittee: Fall 2007 - Spring 2008.

University Library Committee, Fall 2010 - Spring 2013.

Graduate Council Financial Assistance Subcommmittee, Fall 2010 - Spring 2012.

College of Arts and Sciences Committee for the Review of Chairs and Program Directors, Fall 2010 - Spring 2012.

College of Arts and Sciences Committee on Committees, 2016-2018.

Graduate Council, Fall 2019.

Service to the State

Ohio Board of Regents TAG (Transfer Assurance Guide) Faculty Panel, Fall 2010 - present.

Ohio TAG Panel Lead, Fall 2013 - present.

Reviewer for master's degree program proposal for Shawnee State University (2012-2013).

Service to the Profession

Referee for Journal of Pure and Applied Algebra, Communications in Algebra, Hokkaido Journal of Mathematics, Clay Mathematics Institute Proceedings, Discussiones Mathematicae, Ars Mathematica Contemporanea, American Mathematical Monthly, Journal of K-Theory, Semigroup Forum, Involve, Rocky Mountain Journal of Mathematics, Taiwanese Journal of Mathematics, Korean Journal of Mathematics, Electronic Journal of Combinatorics, DCC (Designs, Codes, and Cryptography), Journal of Integer Sequences, Hacettepe Journal of Mathematics.

Reviewer for Math Reviews (2 reviews).

Judge for Undergraduate Research Poster Session (Joint Mathematics Meetings), January 2002.

Conference Organization

Co-organizer (with Beata Randrianantoanina and Patrick Dowling) of *Undergraduate Research*: Oxford, OH: September 28-29, 2013.

Co-organizer (with Louis DeBiasio, Tao Jiang, Zevi Miller, and Dan Pritikin) of *MIGHTY LIV*: Oxford, OH; April 6, 2013.

Co-organizer (with Paul Larson and Zevi Miler) of *The Mathematics of Finance*: Oxford, OH; September 30th - October 1st, 2011.

Co-organizer (with Patrick Brosnan and Roy Joshua) of *Algebraic Cycles II: Progress and Prospects*: Columbus, OH: March 24-29, 2008.

Co-organizer (with Paul Larson and Dan Pritikin) of *Recreational Mathematics*: Oxford, OH; September 26-27, 2008.

Co-organizer (with Paul Larson and Bruce Magurn) of *Number Theory* (Miami University Fall Conference): Oxford, OH; September 28-29, 2007.

Co-organizer (with Roy Joshua and Bruce Magurn) of *Conference on Algebraic Cycles*: Oxford, OH; March 5-6, 2003.

Co-organizer (with Linda Eroh and Carmen Schabel) of Project NExT Special Session *Teaching Students to Write Proofs*, MAA MathFest: Burlington, VT; July 31st, 2002.

Student-Centered Service

Chapter Advisor to Pi Mu Epsilon: Fall 2005 - Spring 2008 and Fall 2009 - Spring 2010.

Worked with supplemental instructors in calculus: (Fall 2000, Fall 2001, Fall 2005, Spring 2006, Fall 2006, Fall 2008, Fall 2019).

Delivered invited oration to Pi Mu Epsilon: Fall 2000, Fall 2004, Fall 2010, Fall 2015.

Funding

Co-principal investgator on NSF grant ($250,000) to support SUMSRI 2019 and 2020 (not awarded).

Co-principal investigator on NSF grant ($28,900), travel for SUMSRI 2018 and 2019 (not awarded).

Co-principal investigator on NSA grant ($125,000) to support SUMSRI 2018 (awarded).

Co-principal investigator on NSA grant ($118,804) to support SUMSRI 2015 (awarded).

Co-principal investigator on NSF grant ($90,000) to support SUMSRI 2015 (not awarded)

Co-principal investigator on NSA grant ($125,000) to support SUMSRI 2014 (not awarded)

Co-principal investigator on NSF Grant ($175,416) to support SUMSRI 2013 and 2014 (awarded).

Co-principal investigator on NSA Grant ($150,000) to support SUMSRI 2013 (awarded).

Co-principal investigator on NSF Grant ($142,541) to support SUMSRI 2011 and 2012 (awarded).

Co-principal investigator on NSA Grant, ($431,270) to support SUMSRI 2011 and 2012 (awarded).

Co-principal investigator on NSA Grant, ($188,441) to support SUMSRI 2010 (awarded).

Awarded USS (Undergraduate Summer Scholars) grants for 2003, 2007, 2009, 2017 to supervise student research in algebra and combinatorics.

Recipient of funds ($500) to attend Lichtenbaum birthday conference, March 2005.

Recipient of funds ($170) to attend Great Lakes K-theory conference, May 2004.

Recipient of funds ($750) to attend Friedlander birthday conference, Sept. 2004.

Exxon-Mobil Project NExT Fellow, 2001.

College of Arts and Sciences Summer Research Grant ($4000), Miami U., 2000.

Committee for Faculty Research Summer Grant ($6000), Miami U., 2000.

Professional Memberships

American Mathematical Society