

Neil Epstein

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Professional history

- George Mason University, Assistant Professor (Mathematical Sciences), 2012-present
- University of Osnabrueck, Germany, Deutsche Forschungsgemeinschaft (= German research foundation) Postdoctoral Fellowship (Mathematics), 2009-2012
- University of Michigan, National Science Foundation Postdoctoral Fellowship (Mathematics), 2005-2009
- University of Kansas, Ph.D. (Mathematics), 2005
- University of Chicago, M.S. (Mathematics), 2000
- Swarthmore College, B.A. (Mathematics and Linguistics), with High Honors, 1998

Research interests

My research concerns commutative algebra, the theory of systems that admit operations of addition, multiplication and subtraction. My work has concentrated mostly on fundamental problems within commutative algebra, a central topic in modern mathematics. It has had close connections with algebraic geometry, combinatorics, and continuous functions. Commutative algebra also has applications to statistics, cryptography, phylogenetics, mass action chemistry, and integer programming.

Publications

21. Neil Epstein and Mel Hochster, *Continuous closure, axes closure, and natural closure*, arXiv:1106.3462, to appear in Trans. Amer. Math. Soc.
20. Neil Epstein and Javid Validashti, *Hilbert-Kunz multiplicity of products of ideals*, arXiv:1601.00014, to appear in J. Commut. Algebra.
19. Neil Epstein and Jay Shapiro, *Perinormality in pullbacks*, arXiv:1511.06473, to appear in J. Commut. Algebra.
18. Neil Epstein and Bernd Ulrich, *Liftable integral closure*, arXiv:1309.6966, to appear in J. Commut. Algebra.
17. Neil Epstein and Yongwei Yao, *Some extensions of Hilbert-Kunz multiplicity*, Collect. Math. **68** (2017), no. 1, 69–85.

16. Neil Epstein and Jay Shapiro, *Perinormality – a generalization of Krull domains*, J. Algebra **451** (2016), 65–84.
15. Neil Epstein and Jay Shapiro, *A Dedekind-Mertens theorem for power series rings*, Proc. Amer. Math. Soc. **144** (2016), no. 3, 917–924.
14. Neil Epstein and Jay Shapiro, *The Ohm-Rush content function*, J. Algebra Appl. **15** (2016), no. 1, 1650009, 14 pp.
13. Neil Epstein, *Semistar operations and standard closure operations*, Comm. Algebra **43** (2015), no. 1 (Special Issue, dedicated to Marco Fontana), 325–336.
12. Neil Epstein and Karl Schwede, *A dual to tight closure theory*, Nagoya Math. J. **213** (2014), 41–75.
11. Neil Epstein and Jay Shapiro, *Strong Krull primes and flat modules*, J. Pure Appl. Algebra **218** (2014), no. 9, 1712–1729.
10. Neil Epstein and Hop D. Nguyen, *Algebra retracts and Stanley-Reisner rings*, J. Pure Appl. Algebra **218** (2014), no. 9, 1665–1682.
9. Neil Epstein and Peyman Nasehpour, *Zero-divisor graphs of nilpotent-free semigroups*, J. Algebraic Combin. **37** (2013), no. 3, 523–543.
8. Neil Epstein, *A guide to closure operations in commutative algebra*, in Progress in Commutative Algebra 2, 1–37, Walter de Gruyter, Berlin, 2012.
7. Neil Epstein and Yongwei Yao, *Criteria for flatness and injectivity*, Math. Z. **271** (2012), no. 3–4, 1193–1210.
6. Joseph P. Brennan and Neil Epstein, *Noether normalizations, reductions of ideals, and matroids*, Proc. Amer. Math. Soc. **139** (2011), no. 8, 2671–2680.
5. Neil Epstein, *Reductions and special parts of closures*, J. Algebra **323** (2010), no. 8, 2209–2225.
4. Neil Epstein and Adela Vraciu, *A length characterization of $*$ -spread*, Osaka J. Math. **45** (2008), no. 2, 445–456.
3. Neil Epstein, *Phantom depth and stable phantom exactness*, Trans. Amer. Math. Soc. **359** (2007), 4829–4864.
2. Neil Epstein, *Phantom depth and flat base change*, Proc. Amer. Math. Soc. **134** (2006), 313–321.
1. Neil Epstein, *A tight closure analogue of analytic spread*, Math. Proc. Cambridge Philos. Soc. **139** (2005), no. 2, 371–383.

Preprints and projects:

(preprint) Neil Epstein and Jay Shapiro, *Gaussian elements of a semicontent algebra*, arXiv:1708.02364, 2017, submitted.

- (preprint) Neil Epstein and Jay Shapiro, *The Ohm-Rush content function II. Noetherian rings, valuation domains, and base change*, arXiv:1703.02144, 2017, submitted.
- (preprint) Neil Epstein and Yongwei Yao, *A computation concerning relative Hilbert-Kunz multiplicities*, arXiv:1605.01807, 2016.
- (project) Geir Agnarsson and Neil Epstein, *On monomial ideals and their socles*, in preparation.
- (project) Neil Epstein and Iosif Vaisman, *Algebraic mutagenic analysis of influenza and dengue*, preliminary.

Fellowships, Affiliations, and Awards

- MAA Project NExT (New Experiences in Teaching) fellow, 2012-13
- Research fellowship, University of Michigan: Summer 2008
- NSF Mathematical Sciences Postdoctoral Research Fellowship: Summer 2005-Spring 2009
- Supplemental Scholarship, University of Kansas: Spring 2005
- U.G. Mitchell Graduate Scholarship (U. Kansas internal award): Summer 2004
- Member: American Mathematical Society, most years since 2003

Students, advising, and training

- with Iosif Vaisman (School of Systems Biology, GMU), ran the project “Algebraic Tools in Bioinformatics” as a constituent part of *Mason Modeling Days*, a 4-day intensive training session for undergraduates, graduate students, and faculty. Our project had about 20 people. June 28-July 1, 2017, Key Bridge Marriott, Arlington VA.
- with Jay Shapiro (Math, GMU), ran a weekly algebra seminar for graduate students during both semesters of 2013 and Spring semester of 2014.
- advised an undergraduate research project for Anna-Rose Wolff. She presented a poster at the 2014 Joint Mathematics Meetings.
- Ph.D. advisor for: George Whelan (January 2013-May 2017) and Thomas Ales (September 2015-present)
- George Whelan successfully defended his thesis April 12, 2017, and graduated at Spring commencement.
- M.S. advisor for: Anna-Rose Wolff (Fall 2014-Spring 2015)
- Host advisor for Dario Spirito, a Ph.D. student of Marco Fontana of Università di Roma tre (September 2014-March 2015)

- Ph.D. dissertation committee member:
 - outside member, at Roma Tre University (Rome, Italy): for Dario Spirito
 - at Mason: for Tim Long, Amy Schmidt, Elie Alhajjar, Jack Love, and Shams Alyusof
 - at Michigan: for Christopher Mueller, Joseph Stubbs, Hannah Robbins, and Tigran Ananyan
 - at Osnabrück: for Peyman Nasehpour and Axel Stäbler
- M.S. committee member for Chris Gray and Kelsie Snyder (both GMU)

Conference organization

- Co-organizer (with Karl Schwede and Janet Vassilev) of the AMS special session “Commutative algebra in all characteristics”, at the Joint Mathematics Meetings in San Diego, 2018, scheduled.
- Co-organizer (with Alan Loper) of the AMS Special Session “Commutative ring theory (in honor of Jay Shapiro’s retirement)”, Southeastern Sectional meeting of the American Mathematical Society, November 2016, Raleigh, NC.
 - 16 people gave talks of 20 minutes each in length, over a span of 2 days.
- Co-organizer (with Sean Sather-Wagstaff and Karl Schwede) of the AMS Special Session “Homological and characteristic p methods in commutative algebra”, Joint Mathematics Meetings, January 2014, Baltimore.
 - 22 people gave talks of 20 minutes each in length, over a span of 2 days.
- Co-organizer (with Lance E. Miller) of the Special Session “Closure operations in commutative algebra”, Eastern Sectional meeting of the American Mathematical Society, March 2015, Georgetown University, DC.
 - 20 people gave talks of 20 minutes each in length, over a span of 2 days.

Course instruction

Courses at Mason

- Math 621 (Algebra I, graduate level), Spring 2018, scheduled.
- Math 629 (Homological Algebra), Fall 2017.
- Math 213 (Analytic Geometry and Calculus III), Summer 2017 (A session).
- Math 203 (Linear Algebra), Spring 2017, two sections.
- Math 724 (Commutative Algebra), Fall 2016.

- Math 290 (Introduction to Advanced Mathematics)¹, Fall 2016.
- Math 213, Summer 2016 (A session).
- Math 213, Spring 2016, two sections.
- Math 290, Spring 2015.
- Math 213, Spring 2015.
- Math 301 (Number Theory), Fall 2014.
- Math 114 (Analytic Geometry and Calculus II), Fall 2014.
- Math 113 (Analytic Geometry and Calculus I), Spring 2014.
- Math 629 (Commutative Algebra II), Fall 2013.
- Math 621, Spring 2013.
- Math 321², Fall 2012.

Courses at Michigan

- Differential Equations, 4 semesters (6 sections total), 2006-2009.
- Commutative Algebra, Fall semester, 2007.

Courses at Kansas

- Calc II, Spring semester 2005.
- Calc I, Fall semester, 2003.

Courses at Chicago

- “Mathematical methods for the social sciences” (Calc III), Spring quarter, 2002.
- Calc II, Winter quarters 2001 **and** 2002.
- Calc I, Fall quarters 2000 **and** 2001.

Talks

Invited conference talks (other than mathematical society meetings)

6. *The tight interior of a module: a dual to tight closure*, also named on the poster, at the conference titled “Commutative algebra & algebraic geometry in the southeast”, November 10, 2013, at the University of South Carolina, Columbia, SC.

¹run as a flipped course both times

²course centered on a structured series of homework assignments, some of which would be done as class group work. No lecturing was involved.

5. *Liftable integral closure*, at the conference titled “Commutative algebra and its interactions with algebraic geometry”, July 12, 2013, at CIRM, Luminy, Marseille, France.
4. *Strong Krull primes and flat modules*, also named on the poster, at the conference titled “Combinatorial structures in algebra and topology”, July 5, 2013, Osnabrück, Germany.
3. *Semistar operations and standard closure operations*, at the conference titled “Commutative rings and their modules”, June 5, 2012, in Bressanone/Brixen, Italy.
2. *Closures of ideals, complements, and matroids*, at the Winter School on Commutative Algebra, held at Institut de Matemàtica, Universitat de Barcelona, February 1, 2006, Barcelona, Spain.
1. *Special parts of closures, and analogues of analytic spread*, as part of the 30th Annual Lecture Series in the Mathematical Sciences, University of Arkansas, April 15, 2005, Fayetteville, AR.

Invited colloquium talks

3. *What’s in a polynomial (or power series)? A partial history of the notion of ‘content’, from 1801 to 2014*, Swarthmore College math department colloquium, October 27, 2015, Swarthmore, PA.
2. *What’s in a polynomial (or power series)? A partial history of the notion of ‘content’, from 1801 to 2014*, Reed College math department colloquium, April 17, 2014, Portland, OR.
1. *Closure operations on ideals in commutative rings*, Reed College math department colloquium, March 29, 2007, Portland, OR.

Invited outside seminar talks

11. *Generic matroids – a bilevel matroid-like structure on sets with topological structure*, Arithmetic seminar, Binghamton University, April 24, 2017.
10. *How well-behaved is your ring map? The Ohm-Rush content function reconsidered*, Commutative Algebra seminar, Ohio State University, February 13, 2017.
9. *Perinormal integral domains and gluing constructions*, Algebra seminar, Georgia State University, April 12, 2016.
8. *Perinormal integral domains*, commutative algebra seminar, University of Virginia, October 14, 2015, Charlottesville, VA.
7. *Perinormal integral domains and gluing constructions*, commutative algebra seminar, University of Michigan September 16, 2015, Ann Arbor, MI.
6. *Homogeneous equational tight closure*, Algebra seminar, University of Kansas, October 13, 2009.
5. *Generic exchange properties in minimal reductions of ideals and in Noether normalizations*, Commutative algebra seminar, Purdue University, September 16, 2009.
4. Algebra seminar, University of South Carolina, June 2007.

3. Commutative Algebra seminar, University of Nebraska, April 2007.
2. *Pieces of closures*, GSU-USC commutative algebra seminar, Georgia State University, March 17, 2007.
1. *A tight closure analogue of analytic spread*, Commutative Algebra seminar, University of Nebraska, October 28, 2004.

Invited session talks at mathematical society meetings

18. (title TBA) at the Special Session “Matroids and Related Structures”, Southeastern Sectional Meeting of the American Mathematical Society, April 14 or 15, 2018, Nashville, TN.
17. (title TBA) at the Special Session “Commutative Algebra”, Southeastern Sectional Meeting of the American Mathematical Society, April 14 or 15, 2018, Nashville, TN.
16. (title TBA) at the Special Session “Multiplicative ideal theory and factorization (in honor of Tom Lucas retirement)”, Central Sectional meeting of the American Mathematical Society, March 17 or 18, 2018, Columbus, OH.
15. *The Ohm-Rush content function II. Noetherian rings and valuation domains*, at the Special Session “Factorization and multiplicative ideal theory”, Southeastern Sectional meeting of the American Mathematical Society, March 11, 2017.
14. *Unmixed Hilbert-Kunz multiplicity*, at the Special Session “Homological methods in commutative algebra”, Southeastern Sectional meeting of the American Mathematical Society, November 13, 2016, NCSU, Raleigh, NC.
13. *Perinormal integral domains, part II* at the Special Session “Commutative ring theory”, Eastern Sectional meeting of the American Mathematical Society, March 19, 2016, Stony Brook University, Stony Brook, NY.
12. *Perinormality in pullbacks*, at the Special Session “Commutative algebra”, Eastern Sectional meeting of the American Mathematical Society, November 14, 2015, Rutgers University, New Brunswick, NJ.
11. *Perinormal integral domains*, at the Special Session “Algebra and representation theory”, Eastern Sectional meeting of the American Mathematical Society, March 8, 2015, Georgetown University, DC.
10. *Closure operations in commutative algebra*, at the Special Session “Directions in commutative algebra: past, present, future (dedicated to the memory of H.-B. Foxby)”, Central Sectional meeting of the American Mathematical Society, September 21, 2014, University of Wisconsin-Eau Claire.
9. *Strong Krull primes and flat modules*, at the Special Session “Interactions in commutative algebra”, Western Sectional meeting of the American Mathematical Society, April 5, 2014, University of New Mexico, Albuquerque, NM.
8. *Zero-divisor graphs of certain semigroups associated to commutative rings*, at the Invited Paper Session ‘Developments in commutative algebra’, MAA MathFest (summer meeting of the Mathematical Association of America), August 1, 2013, Hartford, CT.

7. *Criteria for flatness and injectivity*, at the Special Session “Commutative algebra”, Southeastern Sectional meeting of the American Mathematical Society, March, 2010, University of Kentucky, Lexington, KY.
6. *A numerical criterion for tight closure of arbitrary ideals*, at the Special Session “Local and Homological Methods in Commutative Algebra”, Central Sectional meeting of the American Mathematical Society, March 29, 2009, University of Illinois, Urbana, IL.
5. *An extension of Hilbert-Samuel and Hilbert-Kunz multiplicities to non- m -primary ideals*, at the session “Progress in Commutative Algebra”, Joint Mathematics Meetings, January 8, 2008, San Diego.
4. *Pieces of closures*, at the session “Commutative Algebra and Algebraic Geometry”, Annual meeting of the Canadian Mathematical Society, December 9, 2006, Toronto.
3. *A tight closure analogue of analytic spread and a “special” Briançon-Skoda theorem*, at the session “Commutative Algebra”, Joint Mathematics Meetings, January 5, 2005, Atlanta, GA.
2. *Phantom depth and stable phantom exactness*, at the session “Local and Homological Algebra”, Southeastern sectional meeting of the American Mathematical Society, October 16, 2004, Nashville, TN.
1. *A tight closure analogue of analytic spread*, at the session “Commutative Algebra and Algebraic Geometry”, Eastern sectional meeting of the American Mathematical Society, April 18, 2004, Lawrenceville, NJ.

Local invited talks

13. *How well-behaved is your ring map? The Ohm-Rush content function reconsidered*, CAG seminar, GMU, March 3, 2017.
12. *The space of local overrings of an integral domain*, TAD seminar, GMU, April 24, 2015.
11. *Closure operations in commutative algebra*, 6th Annual Research Symposium, GMU SIAM student chapter, October 3, 2014.
10. *Strong Krull primes and flat modules*, CAG seminar, GMU, May 2, 2014.
9. *Some naturally occurring matroids and matroid-like structures in commutative algebra*, CAG seminar, GMU, September 20, 2013.
8. *Zero-divisor graphs of nilpotent-free semigroups* (2 parts), CAG seminar, GMU, February 8 **and** March 1, 2013.
7. *Criteria for flatness and injectivity*, Graduiertenkolleg seminar, University of Osnabrück, January 4, 2011.
6. *Homogeneous equational tight closure*, Graduiertenkolleg seminar, University of Osnabrück, February 10, 2010.
5. *Some extensions of Hilbert-Kunz multiplicity*, Graduiertenkolleg seminar, University of Osnabrück, January 26, 2010.

4. *Generic matroids in commutative algebra*, Graduiertenkolleg seminar, University of Osnabrück, January 5, 2010.
3. *Two extensions of Hilbert-Kunz multiplicity*, Commutative algebra seminar, University of Michigan, September 18, 2008.
2. *A tight closure analogue of analytic spread*, Algebra seminar, University of Kansas, April 8, 2004.
1. *Phantom depth*, Algebra seminar, University of Kansas, July, 2003.

Other talks

1. *Continuous closure, axes closure, and natural closure*, at the session “Commutative rings and algebras”, Joint Mathematics Meetings, January 6, 2012, Boston.³

Service

- Undergraduate advisor, GMU Department of Mathematical Sciences, since August 2017.
- Curriculum Committee, GMU College of Science, August 2014-July 2017.
- P&H (Policy and Hiring) Committee, GMU math department, academic years 2013-14 and 2014-15. We hired one tenure-track assistant professor, one associate professor, and two temporary term instructors the first year. In the second year, we hired three longer-term term instructors.
- Refereed papers for:
 - *Mathematical Proceedings of the Cambridge Philosophical Society*
 - *Proceedings of the American Mathematical Society*
 - *Beiträge zur Algebra und Geometrie*
 - *Journal of Pure and Applied Algebra*
 - *Journal of Commutative Algebra*
 - *Journal of Algebra*
 - *Communications in Algebra*
 - *Journal of Algebra and its Applications*

³All talks listed were invited except this one, which was contributed.