

Derek Smith

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Education

Ph.D., mathematics, Princeton University, 1999.

“On Finitely-Generated Quantum Logic,” advisor J. H. Conway.

M.A., mathematics, Princeton University, 1995.

B.S., mathematics, North Carolina State University, 1992.

Awards and Grants

Co-PI (with E. McMahon), Research Experience for Undergraduates (DMS-1560222),
National Science Foundation, 2017–20.

Richard King Mellon Research Fellowship, Lafayette College, 2000, 2014.

Dolciani Mathematics Enrichment Grant, MAA, 2012.

Marquis Distinguished Teaching Award, Lafayette College, 2010.

Jones Faculty Lecture Award for Excellence in Teaching and Scholarship,
Lafayette College, 2003.

MAA Project NExT Fellow, 1999.

Princeton University Graduate Fellowship, 1992–97.

Co-Valedictorian, North Carolina State University, 1992.

Positions

Associate Professor, Lafayette College, 2006–present.

Assistant Department Head, 2018–present.

Lafayette Visiting Professor, Jacobs University Bremen, spring 2013 and 2016.

Assistant Professor, Lafayette College, 1999–2006.

Lecturer, Princeton University, 1997–98.

Graduate Instructor, Princeton University, 1996.

Books

- [B] *Exploring Mathematics: An Engaging Introduction to Proof* (with J. Meier), Cambridge University Press, 2017.
- [A] *On Quaternions and Octonions: Their Geometry, Arithmetic and Symmetry* (with J. H. Conway), AK Peters/CRC Press, 2003.

Other Publications

Student co-authors designated by *

- [14] Geodesics in the Sierpinski Carpet and Menger Sponge (with E. Berkove), *Fractals*, to appear.
- [13] Planarity, Duality, and Laplacian Congruence (with L. Traldi and W. Watkins), *Journal of Combinatorial Mathematics and Combinatorial Computing*, to appear.
- [12] A Note on 2-isomorphisms and the Signed Laplacian Matrix of a Graph (with L. Traldi and W. Watkins), *Linear Algebra and its Applications* **563** (2019) 277–286.
- [11] A Note on Dehn Colorings and Invariant Factors (with L. Traldi and W. Watkins), *Journal of Knot Theory and Its Ramifications*, **27**, no. 14 (2018) article 1871003.
- [10] Duality and the Signed Laplacian Matrix of a Graph (with L. Traldi and W. Watkins), *Linear Algebra and its Applications*, **548** (2018) 1–18.
- [9] Lattice Embeddings of Planar Point Sets (with M. Knopf*, J. Milzman*, D. Zhu*, and D. Zirlin*), *Discrete & Computational Geometry*, **56** (2016) 693–710.
- [8] From the Outside In: Solving Generalizations of the Slothouber-Graatsma-Conway Puzzle, in *The Mathematics of Various Entertaining Subjects: Research in Recreational Math*, J. Beineke and J. Rosenhouse eds., Princeton University Press (2015).
- [7] Common Left- and Right-hand Divisors of a Quaternion Integer (with M. Abouzaid*, J. Alper*, S. DiMauro*, and J. Grosslight*), *Journal of Pure and Applied Algebra*, **217** (2013) 779–785.
- [6] The Playground, a problem-solving column in the quarterly *Math Horizons* (2007–2013). Edited 20 issues in total.
- [5] On Cosets of the Unit Loop of Integral Octonions (with M. Abouzaid*, J. Alper*, S. DiMauro*, and J. Grosslight*), *Communications in Algebra*, **35** (2007) 207–214.
- [4] Group-Valued Measures on the Lattice of Closed Subspaces of a Hilbert Space (with J. Harding and E. Jager*), *International Journal of Theoretical Physics*, **44** (2005) 539–548.
- [3] Orthomodular Bell-Kochen-Specker Theorem, *International Journal of Theoretical Physics*, **43** (2004) 2023–2027.
- [2] Algebraic Partial Boolean Algebras, *Journal of Physics A*, **36** (2003) 3899–3910.
- [1] Factorization in the Composition Algebras, *Lecture Notes in Computer Science*, W. Bosma ed., Springer, **1838** (2000) 533–538.

Works In Progress

- [15] Geodesics in Generalizations of the Sierpinski Carpet (with E. Berkove and E. Karangozishvili*), preprint available.
- Short paths in fractals (with M. Auerbach*, E. Berkove, A. Hodapp*, and R. Whitman*).
- 16-dimensional extensions of the octonions (in part with J. H. Conway).
- A trivialization conjecture for signed Laplacian matrices (with L. Traldi and W. Watkins).
- Lattice embeddings of 3-dimensional point sets.

Research Presentations

On geodesics in fractals

- AIMS Conference on Dynamical Systems, Differential Equations and Applications, Atlanta, 2020 (postponed to 2021).
- Fractal Geometry and Dynamical Systems special session, AMS Fall Southeast Sectional Meeting, Gainesville, 2019.
- Algorithmic Dimensions and Fractal Geometry special session, Joint Mathematics Meeting, Baltimore, 2019 (with E. Berkove).
- Math Department Seminar, Pacific University, 2017.
- Math Department Seminar, Lafayette College, 2017.

On lattice embeddings of planar point sets

- Discrete Structures Seminar, University of Bayreuth, 2016.
- Experimental and Constructive Algebra Seminar, RWTH Aachen Graduate School, 2016.
- Math Department Colloquium, Vassar College, 2015.

On octonions and related rings and loops

- Experimental and Constructive Algebra Seminar, RWTH Aachen Graduate School, 2013.
- Math Colloquium, Jacobs University, 2013.
- Algebra Seminar, Warsaw University, 2008.
- Algebra and Number Theory Seminar, Silesian University, Katowice, 2007.
- MASS Colloquium, Penn State, 2006.
- Nonassociative Algebra special session, Joint Mathematics Meetings, Phoenix, 2004.
- Loops '03, Prague, Czech Republic, 2003.
- AMS Spring Eastern Sectional Meeting, NYU, 2003.
- Mathematics Research Colloquium, Bell Labs, 2003.
- Seminar, University of Georgia, Athens, 2002.
- 6th International Conference on Clifford Algebras, Cookeville, TN, 2002.
- ANTS IV, Leiden, Netherlands, 2000.
- Math Department Colloquium, Lehigh University, 2000.
- Math Department Colloquium, Vanderbilt University, 2000.

On partial Boolean algebras and other structures in quantum logic

Discrete Math Seminar, University of Delaware, 2012.

Combinatorics Seminar, MIT, 2005.

International Quantum Structures Association Meeting, Denver, 2004.

Quantum Structures special session, AMS Spring Southeastern Sectional Meeting, Atlanta, 2002.

International Quantum Structures Association Meeting, Cesenatico, Italy, 2001.

Joint Mathematics Meetings, New Orleans, 2001.

Discrete Mathematics Seminar, Princeton University, 1997.

Joint Mathematics Meetings, San Diego, 1997.

On other topics

“Duality, Planarity, and Signed Laplacian Matrices,” Graphs and Matrices special session, AMS Fall Southwest Sectional Meeting, 2020 (tentative).

“Pondering Packing Puzzles: Research in Recreational Mathematics,” Math Department Colloquium, Gettysburg College, 2014.

“Solving a Duplication Problem on a Square Grid,” Experimental Mathematics special session, AMS Fall Eastern Sectional Meeting, Dalhousie University, 2014.

“Solving Generalizations of the Slothouber-Graatsma-Conway Puzzle,” MOVES 2013 Conference, MoMath, NYC, 2013.

“The Middle Levels Conjecture,” Jagellonian University, Krakow, 2008.

“A symmetric chain decomposition of Young’s lattice, $L(5, n)$, when n is odd,” Joint Mathematics Meetings, San Diego, 2002.

“4-dimensional point groups via quaternions,” Algebra Seminar, SUNY-Binghamton, 2000.

Other Presentations

“The Batfox Assignment, and Other 3D Printing Adventures in Third-Semester Calculus,” Fall EPaDel MAA Sectional Meeting, 2019.

“Pondering Pirate Puzzles Purposefully,” with co-presenters J. Arfin*, M. Shulman*, and B. Strickland*, MOVES 2015 Conference, MoMath/CUNY, 2015.

Mathematical animations for “ $2^{57,885,161}-1$,” a modern ballet based on number theory, directed by choreographer N. Gibson. Philadelphia premiere, 2015, and Lafayette College, 2016.

Thomas L. Pirnot Lecture in Mathematics, Kutztown University, 2014.

“The Fitch Cheney Five-Card Trick,” MOVES 2013 Conference, MoMath/NYC, 2013.

“Investigating a Family of Packing Puzzles,” Jacobs University Math Society, 2013.

“Problems, Problems, Problems” Panelist, MAA Northeast Sectional Meeting, 2012.

“Never Cross a Sea Urchin: A Problem in 3-Dimensional Geometry,” MAA Northeast Sectional Meeting, 2012.

Math Department Colloquium, Susquehanna University, 2007.
 “Quaternions for Fun and Profit,” Lafayette-Lehigh Conference on Graduate School, 2006.
 Math Department Colloquium, Middlebury College, 2005.
 “Extra-curricular Student Math Activities” Panelist, Project Next-EPADEL Spring Meeting, 2005.
 “Irrational Geometry,” Epsilon Talk, Moravian College, 2005.
 Undergraduate Math Conference Keynote Address, Shippensburg University, 2005.
 Math Department Colloquium, Susquehanna University, 2003.
 “Mathematical Card Tricks,” a 2-day workshop with C. Mulcahy, Math Jubilee, University of Georgia, Athens, 2002.
 “Reading and writing (and speaking!) in mathematics,” Project NExT, New Orleans, 2001.
 “The Pizza Problem, and other proofs without words,” Vanderbilt University, 2000.

Teaching

Courses (Lafayette course number)

Modeling and Differential Calculus (Math 125)
 Discrete Structures (Math 146/182)
 Calculus I, II, and III (Math 161, 162, and 263)
 Applied Statistics (Math 176/186)
 Differential Equations with Linear Algebra (Math 264)
 Vector Spaces (Math 275)
 Transition to Theoretical Mathematics (Math 290)
 Geometry (Math 323)
 Number Theory (Math 328)
 Abstract Algebra (Math 351)
 Real Analysis (Math 356)
 Conjecture and Prove (Math 377, special topic)
 Lattices and More Lattices (Math 371, special topic)
 Combinatorial Game Theory (Math 370, special topic)
 Gambling: Here and Everywhere (VaST 282)

Honors theses

Mike Van Ness: Lattices and cryptography, co-advisor Jon Dahl, 2019–20.
 Ben Adenbaum: Signed Laplacian matrices and graphs, 2018–19.
 Helen Hutchens: Study of an expansion tube (Mech E), outside reader 2014–15.
 Heidi Verheggen: Diophantine analysis, 2011–12.
 Peter McGrath: Lattice basis reduction, 2010–11.
 Brian Kronenthal: Combinatorial game theory, 2006–07.
 Ekaterina Jager: Coding theory, 2005–06.

Carrie Abildgaard: Foundations of financial mathematics, 2003–04.
Volkan Öktem: Image processing (ECE), outside reader 2003–04.
Steve DiMauro: Combinatorial game theory, 2001–02.

Lafayette EXCEL research students

Elene Karangozishvili, summer and fall 2018.
Andrej Ilievski, fall 2017, spring 2018.
Dantong Zhu, summer 2014.
Liang Zhang, winter 2013.
Edward Karasiewicz, winter 2009.
Brian Kronenthal, spring 2005.
Ekaterina Jager, summers 2002, 2003, and 2005, and winter 2005.
Steve DiMauro, summer 2001.

Other student mentorship

REU research group mentor, summers 2001, 2014, and 2019.
Summer research with Dantong Zhu on Graph Nim, 2016.
Independent study with Jason Saied on combinatorial game theory, fall 2014.
Independent study with Heidi Verheggen on factorization in rings, spring 2011.
Lafayette Problem Group instructor and organizer, most semesters.

Professional Service

Dolciani Mathematics Enrichment Grant review panel, 2017 and 2018.
MAA Joint Mathematics Meetings Invited Address committee, 2016.
Editorial Board, *Math Horizons*, 2008–13.
Problem Section editor/co-editor of *Math Horizons*, 2007–13.
Lower Michigan Mathematics Competition author, 2004 and 2005.
“Geometry and Arithmetic of Lattices” co-organizer, AMS Eastern Sectional Meeting, spring 2004.
Referee for *American Mathematical Monthly*, *Ars Combinatorica*, *Beiträge zur Algebra und Geometrie*, *Integers*, *Journal of Algebra*, *Journal of Number Theory*, *London Mathematical Society*, *Proceedings of the AMS*, and *Sociology Compass*.

May 15, 2020