

## **Derek Smith**

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### **Education**

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

“On Finitely-Generated Quantum Logic,” advisor John 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 grant (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, 1999–2000.

Princeton University Graduate Fellowship, 1992–97.

Co-Valedictorian, North Carolina State University, 1992.

### **Positions**

Associate Professor, Lafayette College, 2006–present.

Assistant Department Head, 2018–2020.

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.

## General Research Interests

Algebra, combinatorics, and geometry.

## Articles

Student co-authors designated by \*

- Planarity, duality, and Laplacian congruence (with L. Traldi and W. Watkins),  
*Journal of Combinatorial Mathematics and Combinatorial Computing*, accepted.
- 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.
- 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).
- Duality and the signed Laplacian matrix of a graph (with L. Traldi and W. Watkins),  
*Linear Algebra and its Applications*, **548** (2018) 1-18.
- Lattice embeddings of planar point sets (with M. Knopf\*, J. Milzman\*, D. Zhu\*, and D. Zirlin\*), *Discrete & Computational Geometry*, **56** (2016) 693-710.
- 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 (2016).
- 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.
- The Playground, a problem-solving column in the quarterly *Math Horizons* (2007-2013), 20 columns in total.
- 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.
- 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.
- Orthomodular Bell-Kochen-Specker theorem, *International Journal of Theoretical Physics*, **43** (2004) 2023-2027.
- Algebraic partial Boolean algebras, *Journal of Physics A*, **36** (2003) 3899-3910.
- Factorization in the composition algebras, *Lecture Notes in Computer Science*, W. Bosma ed., Springer, **1838** (2000) 533-538.

## Books

- Exploring Mathematics: An Engaging Introduction to Proof* (with J. Meier),  
Cambridge University Press, 2017.

*On Quaternions and Octonions: Their Geometry, Arithmetic and Symmetry* (with J. H. Conway), AK Peters/CRC, 2003.

### **Works in Progress**

Geodesics in the Sierpinski Carpet and Menger Sponge (with E. Berkove), submitted.

Current projects also include geodesics in generalizations of the Sierpinski carpet (with E. Berkove and E. Karangozishvili\*); signed Laplacian matrices (with L. Traldi and W. Watkins); and 16-dimensional extensions of the octonions.

### **Research Presentations**

Some with co-authors and/or co-presenters

#### **On geodesics in fractals**

Algorithmic Dimensions and Fractal Geometry special session, Joint Mathematics Meeting, Baltimore, 2019.

Fractal Geometry and Dynamical Systems special session, AMS Southeast Sectional Meeting, Gainesville, 2019.

Math Department Seminar, Pacific University, 2017.

Math Department Seminar, Lafayette College, 2017.

#### **On integer distance problems and 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 the integral 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.

Joint Mathematics Meetings, Phoenix, 2004.

Loops '03, Prague, Czech Republic, 2003.

AMS 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 topics in quantum logic**

Discrete Math Seminar, University of Delaware, 2012.

Combinatorics Seminar, MIT, 2005.

IQSA Quantum Structures, Denver, 2004.

AMS 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.

### **Other**

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

“Solving a Duplication Problem on a Square Grid,” AMS 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 section meeting, 2019.

“Pondering Pirate Puzzles Purposefully,” with 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 Section meeting, 2012.

“Never Cross a Sea Urchin: A Problem in 3-Dimensional Geometry,” MAA Northeast Section 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.  
 “Quaternions and octonions, flipbooks and party hats,” 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 no.)**

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: Lattice and cryptography, co-advisor Jon Dahl, 2019–20.  
 Ben Adenbaum: Signed Laplacian matrices and graphs, 2018–19.  
 Helen Hutchens: Mechanical engineering, 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.  
Steve DiMauro: Combinatorial game theory, 2001–02.

### **EXCEL 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**

REU research group mentor, summers 2001, 2014, and 2019.  
Summer work with Dantong Zhu on Graph Nim, summer 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, fall 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.  
Member (off and on) of the American Mathematical Society, Mathematical Association of America, and International Quantum Structures Association.  
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*.

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