

VICTORIA POWERS

Curriculum Vita

Dept. of Mathematics and Computer Science
Emory University
Atlanta, GA 30322
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Education

- Ph.D in Mathematics, August 1985, Cornell University
Supervisor: Alex Rosenberg
Dissertation: *Finite Constructable Spaces of Signatures*
- B.A. with Honors in Mathematics, June 1980, University of Chicago

Employment

- Emory University, Professor, 2006-
- Emory University, Associate Professor, 1993-2006
- Emory University, Assistant Professor, 1987-1993
- University of Hawaii, Assistant Professor, 1985-1987

Visiting and Temporary Positions

- Program Officer August 2013 - August 2015
National Science Foundation Arlington, VA
- Visiting Professor September 2002 - July 2003
Universidad Complutense Madrid, Spain
- Alexander von Humboldt research professor August 1991- July 1992
Universität Regensburg Regensburg, Germany

Grants and Awards

- ECCAD 2010 conference grant
- National Science Foundation \$13,326
- Positive Polynomials, Sums of Squares, and Applications 2005-07
- National Security Agency \$33,773
- Programa de sabbaticas en España 9/02-7/03
- Ministry of Education, Spain 10 months support
- Symbolic Computational Algebra (co-PI) conference grant
- National Science Foundation \$35,000
- Alexander von Humboldt Research Fellowship 8/91-7/92
- Alexander von Humboldt Foundation 12 months support
- Deutsche Akademischer Austausch Dienst, Study Visit Grant (one month support), 1995

- Association for Women in Mathematics Travel Grant; 1989, 1995.

Refereed Publications:

1. Positive Polynomials and Sums of Squares: Theory and Practice, *Panorama et Synthèse*, to appear.
2. Polynomials non-negative on strips and half-strips (with H. Nguyen), *J. Pure Appl. Algebra* 216 (2012), no. 10, 2225-2232.
3. (with M. Castle and B. Reznick) Pólya's Theorem with zeros, *J. Symb. Comp.* **46** (2011), 1039-1048.
4. Rational certificates of positivity for compact semialgebraic sets. *Pac. J. Math.* **251** (2011), 385-391.
5. (with M. Castle and B. Reznick) A quantitative Pólya's Theorem with zeros, *J. Symb. Comp.* **44** (2009), 1285-1290.
6. (with J. Demmel and J. Nie) Representations of positive polynomials on non compact semialgebraic sets via KKT ideals, *J. Pure Appl. Algebra* **209** (2007), 189–200.
7. (with B. Reznick) A quantitative Pólya's Theorem with corner zeros. In Proceedings of the 2006 International Symposium on Symbolic and Algebraic Computations, J.-G. Dumas, editor, New York, NY, ACM Press, pp. 285–290, 2007.
8. (with B. Reznick) Polynomials positive on unbounded rectangles, *Positive polynomials in control*, 151–163, Lecture Notes in Control and Inform. Sci. **312**, Springer, Berlin, 2005.
9. (with B. Reznick, C. Scheiderer, and F. Sottile) A new approach to Hilbert's theorem on ternary quartics, *C. R. Math. Acad. Sci. Paris* **339** (2004), no. 9, 617–620.
10. Sumas de cuadrados, polinomios positivos y optimizacion en conjuntos semialgebraicos, *La Gaceta de la Real Sociedad Matematica Española*, **7**, no. 2 (2004), 540-552.
11. Positive polynomials and the moment problem for cylinders with compact cross-section, *J. Pure Appl. Alg.* **188** (2004), 217-226.
12. (with D. Bailey) Computational approaches to representation theorems for partially ordered real algebras, *Algorithmic and quantitative real algebraic geometry*, 13–21, DIMACS Ser. Discrete Math. Theoret. Comput. Sci., 60, Amer. Math. Soc., Providence, RI, 2003.
13. (with C. Scheiderer) The moment problem for non-compact semialgebraic sets, *Advances in Geometry* **1** (2001), 71-88.
14. (with B. Reznick) A new bound for Pólya's Theorem with applications to polynomials that are positive on polyhedra, *Effective Methods in Algebraic Geometry*, *J. Pure and Applied Alg.* **164** (2001), 221-229.
15. (with B. Reznick) Notes towards a constructive proof of Hilbert's theorem on ternary quartics, *Quadratic forms and their applications (Dublin, 1999)*, 209–227, Contemp. Math. **272**, Amer. Math. Soc., Providence, RI, 2000.
16. (with B. Reznick) Polynomials that are positive on an interval, *Trans Amer Math Soc* **352** (2000), 4677-4692.

17. (with E. Becker and T. Wörmann) Deciding positivity of real polynomials, *Real algebraic geometry and ordered structures (Baton Rouge, LA, 1996)*, 19–23, Contemp. Math. **253**, Amer. Math. Soc., Providence, RI, 2000.
18. (with T. Wörmann) An algorithm for sums of squares of real polynomials, *Journal of Pure and Applied Algebra* **127** (1998), 99–104.
19. Hilbert's 17th problem and the champagne problem, *American Mathematical Monthly* **103** (1996), 879–887.
20. (with E. Becker) Sums of powers in rings and the real holomorphy ring, *Journal für die reine und angewandte Mathematik* **480** (1996), 71–103.
21. Valuations and higher level orders in commutative rings, *Journal of Algebra* **172**, 255–272 (1995).
22. (with M. Marshall) Higher level form schemes, *Communications in Algebra* **21(11)**, 4083–4102 (1993).
23. Holomorphy rings and higher level orders in skew fields, *Journal of Algebra* **136**, 51–59 (1991).
24. Higher level orders on noncommutative rings, *Journal of Pure and Applied Algebra* **67**, 285–298 (1990).
25. Finite spaces of signatures, *Canadian Journal of Mathematics* Vol XLI, No. 5, 808–829 (1989).
26. Finite spaces of signatures: research announcement, in Proceedings of a Conference on Quadratic Forms and Real Algebraic Geometry, *Rocky Mountain Journal of Mathematics* **19**, 893–895 (1989).
27. Higher level reduced Witt rings of skew fields, *Mathematische Zeitschrift* **198**, 545–554 (1988).
28. Characterizing reduced Witt rings of higher level, *Pacific Journal of Mathematics* **128**, 333–347 (1987).

Book Edited:

1. E. Green, S. Hosten, V. Powers, and R. Laubenbacher, editors, Symbolic Computation: Solving Equations in Algebra, Analysis, and Engineering, Cont. Math. **286**, American Mathematical Society, 2001.

Talks (since 2007)

1. The Moment Problem and Representations of Positive Polynomials on Noncompact Semialgebraic Sets, Colloquiumfest in honor of Murray Marshall, University of Saskatchewan, Saskatoon, Canada, August 31, 2016.
2. Certificates of Positivity for Polynomials Nonnegative on Compact Semialgebraic Subsets of the Plane, special session on Discrete and Applied Algebraic Geometry, AMS Southeast Section meeting, Univ. of Georgia, Athens, GA, March 6, 2016.
3. Positive Polynomials and Sums of Squares: Theory, Practice, and Applications. colloquium talk, Temple University, Philadelphia, PA, November 2014.

4. The Best Way to Choose a Winner, Women and Mathematics seminar, University of Konstanz, Germany, April 14, 2014.
5. The Best Way to Choose a Winner, colloquium talk, George Mason University, VA, Nov. 15, 2013.
6. Comparing Pairwise and Election Outcomes, MAA sectional meeting, Hampden-Sydney College, VA, Nov. 2, 2013
7. Certificates of Positivity: Theory, Practice, and Applications, invited plenary speaker, Triangle Lectures in Combinatorics, NC State University, NC, Sept. 21, 2013.
8. Proportional (Mis)representation: The Mathematics of Apportionment, Infinite Horizons seminar, Kennesaw State University, GA, Sept. 27, 2012.
9. Pólya's Theorem with zeros, Algebra and Logic seminar, University of Saskatchewan, Canada, August 23, 2012.
10. Certificates of Positivity: Theory and Practice. Convex Algebraic Geometry, Math Fest 2012, Madison, WI, August 2, 2012.
11. Pólya's Theorem with zeros, Algebra seminar, University of Konstanz, Germany, July 2012.
12. Positivity and Sums of Squares: Theory and Practice, plenary talk, conference on Real Algebraic Geometry, Univ. of Rennes, France, June, 2011.
13. Rational Certificates of Positivity, ECCAD 2011 plenary talk, University of Waterloo, April 9, 2011.
14. Pólya's Theorem with zeros, colloquium, University of Waterloo, Canada, May 7, 2010.
15. Representations of positive polynomials, NSF workshop on the future of symbolic computation research, University of Rhode Island, May 1, 2009.
16. Pólya's Theorem, applications and generalizations. AMS special session on Concrete Aspects of Real Polynomials, University of Illinois at Urbana-Champaign, March 28, 2009.
17. Pólya's theorem with zeros, LAW 08, Slovenia, May 30, 2008.
18. A quantitative Pólya's Theorem with zeros, MEGA 2007, Strobl, Austria, June 25, 2007.
19. The Moment Problem and Real Algebraic Geometry, colloquium, University of Illinois at Urbana-Champaign, April 5, 2007.
20. Pólya's Theorem with zeros, Reelle Algebraische Geometrie, Oberwolfach, Germany, March 16, 2007.
21. Sums of Squares, Gradient Ideals, and Optimization, workshop on Optimization and Control, IMA, University of Minnesota, January 18, 2007.

Recent Non-research Talks and Panels

1. Mathematics serving students in other disciplines, AMS Comm. on Education panel, Joint Mathematics Meeting, San Diego, CA, Jan. 12, 2013.
2. Proportional (Mis)representation: The Mathematics of Apportionment, Infinite Horizons Series, Kennesaw College, GA, Sept. 27, 2012.

Professional Service

- Outside examiner for PhD thesis, University of Konstanz, Germany, October 2015.
- American Mathematical Society Council, member at large, 2012-2015.
- AMS Meetings and Conferences Committee, 2012-15.
- AWM Falconer Lecture Selection Committee, 2009-2012; chair, 2011-12.
- Southeast Section Speaker Selection Committee, American Mathematical Society, 2007-2009; chair 2008-09.
- Arnold Ross Lecture series committee, American Mathematical Society, 2003-2005. Chair 2004-5.
- Grant reviews for NSF, NSERC of Canada
- Instructor in the EDGE program at Spelman college, June 2001. This is a program to prepare women for graduate school in mathematics.
- Referee for various journals and conference proceedings.
- Reviewer for Mathematical Reviews.

Conferences Organized

- Scientific Committee, CIRM conference on Ordered Algebraic Structures and Related Topics, CIRM, Luminy, France, October 12-16, 2015.
- Conference chair, East Coast Computer Algebra Day, Emory University, May 15, 2010
- Organizer, Special session on Concrete Aspects of Real Polynomials, AMS meeting, Champaign-Urbana, IL, March 27-29, 2009.
- Organizer, Workshop on Positive Polynomials and Optimization, Banff International Research Station, Oct. 7-12, 2006.
- Organizer, special session on Algorithmic Algebraic and Analytic Geometry, American Mathematical Society annual meeting, Atlanta, Jan. 2005.
- Organizer, semester-long program on Topological Aspects of Real Algebraic Geometry, Mathematical Sciences Research Institute, Berkeley, CA, Jan-May, 2004.
- Co-chair, Symbolic Computational Algebra, University of Western Ontario, July 2002.
- Co-chair, Symbolic Computation: Solving Equations in Algebra, Geometry, and Engineering, AMS/SIAM/IMS Joint Summer Research Conference, June 2000.
- Ran a special session on Concrete Aspects of Real Polynomials (jointly with Bruce Reznick), American Mathematical Society meeting, October, 1997, Atlanta.
- Ran a special session on Quadratic Forms and Real Algebraic Geometry (jointly with Colm Mulcahy) during the American Mathematical Society meeting, May, 1989, Chicago.

University service (since 2000)

- University Faculty Life Course Committee: 2016-9

- ECAS Senate – senator: 2015 - 6
- ECAS strategic planning, Faculty Excellence working group, co-chair: 2015-6
- Psychology and QuanTM joint search committee, member: 2015-6
- Educational Policy Committee: 2011-2014
- President’s Advisory Committee: 2010-2013
- Woodruff Natural Sciences Selection Committee: 2011-13
- McMullan Award Committee, 1999, 2011
- Emory College Tenure and Promotion Committee: 2007-2010
- SIRE Graduate Fellowship review committee: 2010
- SIRE undergraduate research grants selection committee: 2006-2009
- Emory Scholars Selection Committee: 1995-97, 1999-2002, 2003-6
- Honor Council liaison 2002-present
- Faculty advisor to the honor council: 1998-2002, 2006-present
- Deans Teaching Fellowship selection committee: 2006
- Goodrich C. White Scholarship selection committee, 2005
- Goldwater Scholarship selection: 2006
- Faculty panel, Emory Preview, 2000-01, 2005-6, 2008
- EPC subcommittee on GERs 2004-5
- FAME advisor 2004-5, 2007-8
- President’s Commission on the Status of Women, 1999-2002; Chair of the Faculty Concerns Committee, 2001-02
- Athletic Policy and Recreation Committee, 2001-2, 2003-4
- Science Council, General Science Committee, 1998-2002
- Integrated Science Committee, 1999-2001
- Passages Program advisory board, 2000-01
- Honor Code Committee, 1999-2000

Departmental Service

- Math Lecturer search committee, 2016-7
- Emory College cluster hire search committee, 2016-7
- Undergraduate Committee, 1994-present
- Math 250 assessment, 2015-6

- co-Director of Undergraduate Studies, 2010-2013
- Department PACE liaison, 2009-2013
- N-16 Postdoc Committee, 2008-9
- Hiring committees - 1999-2000, 2000-01, 2012-13
- Director of Undergraduate Studies, 1996-2006
- Undergraduate advisor, 1994-present
- Junior faculty and T.A. advisor/mentor, 1995-present
- Course development: Math 115/116, 119, 207, Math and Politics freshman seminar
- Graduate Student Seminar (founded 1997, in charge 97-99)

PhD Students

1. Kathleen Krzastek, PhD 1998, high school mathematics teacher in Cherokee County, GA.
2. Dionne Bailey, PhD 2001, Associate Professor, Angelo State University, San Angelo, TX.
3. Mari Castle, PhD 2009, Assistant Professor, Kennesaw State University, GA.
4. Ha Nguyen, PhD 2010, Lecturer, Georgia Southern University, Statesboro, GA.

Undergraduate Honors Students

1. Chi Yui Fang, 1991. Thesis: Coding Theory of Compact Discs
2. Alisa Marzilla, 1997. Thesis: An Algorithm for Sums of Squares of Polynomials
3. Jacob Ensign, 2007. Thesis: Vote Buying and Multi-Dimensional Preference Space.