

Marc A. Chamberland
curriculum vitae
November 3, 2017

Personal Information

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Citizenship: Canadian, US Resident Alien (“Green Card”)

Academic Appointments

1995–1997 NSERC Postdoctoral Fellow, McMaster University, Canada

1997 Visiting Researcher, University of Waterloo, Canada

1997 Visiting Researcher, Wilfred Laurier University, Canada

1997–2003 Assistant Professor of Mathematics, Grinnell College

2003–2009 Associate Professor of Mathematics, Grinnell College

2004–2005 Sabbatical Visitor, Dalhousie University, Canada

2009– Professor, Grinnell College

2010– Myra Steele Professor of Mathematics, Grinnell College

Education

1988 BMath (Applied Mathematics), University of Waterloo

- Dean's Honours List
- Music Minor

1990 MMath (Applied Mathematics), University of Waterloo

- Supervisor: V. Zeidan
- Thesis: "The Free Final Time Problem in Optimal Control Theory"

1995 Ph.D. (Applied Mathematics), University of Waterloo

- Supervisor: G.M.L. Gladwell
- Thesis: "The Pompeiu Problem and Schiffer's Conjecture"

Scholarships, Awards, and Fellowships

1983–1988 Descartes Scholarship, University of Waterloo

1986,1987 NSERC Summer Research Scholarship

1988 Putnam Prize Winner (top 3% in the 1987 Putnam Competition)

1988–1992 NSERC Graduate Scholarship

1992–1993 Queen Elizabeth II Scholarship, (only 6 given each year in Ontario)

1995–1997 NSERC Postdoctoral Fellowship

2001–2002 Harris Fellowship, Grinnell College (only 2 given each year)

2004–2005 Mellon Semester Leave (one given each year to Grinnell College)

2012–2013 Semester Leave added to sabbatical

Funding

Grinnell College

1997 Research collaboration trip to University of Nebraska-Lincoln: \$743

1997 Faculty-Faculty Tutorial with Professor Vince Eckhart (biology),
"Differential-equation Models for Teaching Ecology": \$3000

- 1998** Summer research students: \$3000
- 1999** Develop web-based tools for “Chaos and Fractals” course: \$500
- 1999** Summer research students: \$8000
- 1999** Research collaboration trip to Katholische Universität Eichstätt, Germany: \$2100
- 2000** Summer research students: \$8000
- 2002** Summer research students: \$12000
- 2003** Summer research students: \$6400
- 2004** Summer research students: \$6400
- 2006** Travel support: \$3200
- 2007** Summer research students: \$6800
- 2007** Travel support: \$2000
- 2011** Summer research students: \$10200
- 2015** Summer research students: \$10200
- 2016–2018** Innovation Fund for Popularizing Mathematics

Non-Grinnell sources

- 1997–1998** PEW support for visit to Macalester College, host visitor at Grinnell College: ~\$1000
- 2000** AMS Travel Grant to present paper at “Mathematical Challenges of the 21st Century”: \$1000
- 2002** Travel support from the Unione Matematica Italiana to Pisa: \$200
- 2002** Travel support from Professor David Siegel, University of Waterloo, Canada: ~\$400
- 2003** PEW support for visit to the University of Washington in St. Louis: ~\$772
- 2003** Lilly Foundation grant for group trip to Taizé, France : ~\$10,000
- 2004** Mellon Foundation support for ”Workshop on Mathematical Modeling”: ~\$9,000
- 2006–2009** NSF-CCLI Grant \$75,000 to develop a course in Experimental Mathematics

Teaching Experience

Grinnell College (1997–present)

regular courses : Tutorial (Time), calculus (traditional and reform), linear algebra, differential equations, sequences and series, chaos and fractals, mathematical modeling, real analysis, complex analysis, senior seminar (experimental mathematics), problem-solving seminar

independent courses : partial differential equations, linear programming, Fourier analysis, flows on manifolds, celestial mechanics, complex dynamics, discrete chaos theory.

McMaster University (1996–1997): differential equations, vector calculus, calculus of variations, mathematical biology

Wilfred Laurier University (1996): calculus

University of Waterloo (1992–1994): calculus, differential equations, control theory

Service

Grinnell College

- MAA department representative (1997–2004)
- Mathematical Contest in Modeling coordinator (1997–2001, 2003–2004)
- Library and Bookstore Committee (1998–1999)
- Bowen Scholarship Interviewer (1999–2000)
- Marshall & Rhodes Scholarships (1999–2000)
- Iowa Mathematical Competition coordinator (1999–2000,2001)
- Scholarship Selection Committee (1999–2001,2002–2003, 2011–2012)
- Phase II Building Committee (2000–2001,2002–2004)
- Putnam Mathematical Competition coordinator (2001–2002, 2008–2009)
- General Science Committee, mathematics representative (2003–2004)
- Lilly Steering Committee (2003–2009)
- Taizé Project leader (2002–2004)
- Science Division Personnel Committee (2005–2006)
- Lilly Internship Committee (2005–2006, 2007–2010)
- Lilly Post-Graduate Fellowship Committee (2005–2010)
- Noyce Visiting Professor Committee (2005–2010)

- Committee for the Support of Faculty Scholarship (2006–2009)
- CHAIR of Mathematics and Statistics (2006–2008)
- Watson Committee (2009–2010,)

University of Waterloo

- Graduate Student Representative to Mathematics Faculty Council (1991–1992, 1993–1994)
- Mathematics Graduate Student Representative to Senate (1992–1993)

Other

- Judge for Undergraduate Student Poster Session at Joint Mathematical Meetings (1999–2001, 2002–2004, 2006–2008)
- Team member for mathematics department review at Claremont McKenna College, fall, 2010
- Chair of mathematics department review at Denison University, spring, 2011
- Associate Editor for *Math Horizons*, 2015–

Books

- M. Chamberland. “Single Digits: In Praise of Small Numbers”, Princeton University Press, 2015, 240pp.

Refereed Journal Articles – Research

1. M. Chamberland, G.Tenti. “Nonlinear, Steady-State Joule Heating in Metals”, *Applied Mathematical Notes*, 11 (1987), 1–17.
2. M. Chamberland, G.M.L. Gladwell. “On Transforming Three-Dimensional Inverse-Scattering Problems to One Dimension”, *Inverse Problems*, 9 (1993), 241–249.
3. M. Chamberland, A.S. Lewis. “Contours of Liapunov Functions”, *Journal of Optimization Theory and Applications*, 80 (1994), 149–160.
4. N.B. Willms, M. Chamberland, G.M.L. Gladwell. “A Duality Theorem for an Overdetermined Eigenvalue Problem”, *Zeitschrift für die Angewandte Mathematik und Physik*, 46 (1995), 623–629.

5. M. Chamberland, G.M.L. Gladwell. “A Characterization of the Disc by Sets of Uniqueness”, *Zeitschrift für die Angewandte Mathematik und Physik*, 46 (1995), 807–811.
6. M. Chamberland. “Mean Value Integral Equations and the Helmholtz Equation”, *Results in Mathematics*, 30 (1996), 39–44.
7. M. Chamberland. “A Continuous Extension of the $3x + 1$ Problem to the Real Line”, *Dynamics of Continuous, Discrete and Impulsive Systems*, 2 (1996), 495–510.
8. M. Chamberland, D. Siegel. “Convex Domains with Stationary Hot Spots”, *Mathematical Methods in the Applied Sciences*, 20 (1997), 1163–1169.
9. M. Chamberland, G. Meisters. “A Mountain Pass to the Jacobian Conjecture”, *Canadian Mathematical Bulletin*, 41 (1998), 442–451.
10. M. Chamberland. “Global Asymptotic Stability and the Jacobian Conjecture”, *Canadian Applied Mathematical Quarterly*, 5 (1998), 331–339.
11. M. Chamberland, R. Cressman. “An Example of Dynamic (In)Consistency in Symmetric Extensive Form Evolutionary Games”, *Games and Economic Behavior*, 30 (2000), 319–326.
12. M. Chamberland. “Families of Solutions of a Cubic Diophantine Equation”, *The Fibonacci Quarterly*, 38 (2000), 250–253.
13. M. Chamberland. “Diffeomorphic Real-Analytic Maps and the Jacobian Conjecture”, *Mathematical and Computer Modelling*, 32 (2000), 727–732.
14. O. Andriychenko, M. Chamberland. “Iterated strings and cellular automata”, *Mathematical Intelligencer*, 22 (2000), 33–36.
15. M. Chamberland, D. Siegel. “Polynomial Solutions to Dirichlet Problems”, *Proceedings of the American Mathematical Society*, 129 (2001), 211–217.
16. M. Chamberland, M. Martelli. “Unbounded Orbits and Binary Digits”, *Journal of Difference Equations and Applications*, 9 (2003), 687–691.
17. M. Chamberland. “Unbounded Ducci Sequences”, *Journal of Difference Equations and Applications*, 9 (2003), 887–895.
18. M. Chamberland. “Characterizing Two-Dimensional Maps whose Jacobians have Constant Eigenvalues”, *Canadian Mathematical Bulletin*, 46 (2003), 323–331.

19. M. Chamberland. “Binary BBP-Formulae for Logarithms and Generalized Gaussian-Mersenne Primes”, *Journal of Integer Sequences*, 6 (2003), article 03.3.7, 10pp.
20. M. Chamberland. “Una actualizació del problema $3x+1$ ” (Catalan, translated by Toni Guillamon i Grabolosa) [An Update on the $3x+1$ Problem], *Butlletí de la Societat Catalana de Matemàtiques*, 18 (2003), 19–45.
21. M. Chamberland, D. Thomas. “The N - Number Ducci Game - Open Problems”, *Journal of Difference Equations and Applications*, 10(3), (2004), 339–342.
22. M. Chamberland, J. Llibre and G. Swirszcz, “Weakened Markus-Yamabe conditions for 2-dimensional global asymptotic stability”, *Nonlinear Analysis*, 59, (2004), 951–958.
23. M. Chamberland, A. van den Essen, “Nilpotent Jacobians in Dimension Three”, *Journal of Pure and Applied Algebra*, 205, (2006), 146–155.
24. M. Chamberland, “Dynamics of Maps with Nilpotent Jacobians”, *Journal of Difference Equations and Applications*, . 12(1), (2006), 49–56.
25. M. Chamberland and V.H. Moll, “Dynamics of the Degree Six Landen Transformation”, *Discrete and Continuous Dynamical Systems*, . 15(3), (2006), 905–919.
26. M. Chamberland and K. Dilcher, “ Divisibility Properties of a Class of Binomial Sums”, *Journal of Number Theory*, . 120, (2006), 349–371.
27. M. Chamberland and C. French. “Generalized Catalan Numbers and Generalized Hankel Transformations”, *Journal of Integer Sequences*, 10 (2007), article 07.1.1, 7pp.
28. M. Chamberland, A. Cima, A. Gasull, and F. Manosas, “Characterizing Asymptotic Stability with Dulac Functions”, *Discrete and Continuous Dynamical Systems*, 171, (2007), 59–76.
29. J. Borwein, M. Chamberland, “Integer Powers of Arcsin”, *International Journal of Mathematics and Mathematical Sciences*, Article ID 19381, 10 pages, (2007).
30. M. Chamberland, M. Martelli, “The Mean-Median Map”, *Journal of Difference Equations and Applications*, 137, (2007), 577–583.
31. M. Chamberland, “Using Integer Relations Algorithms for finding Relationships among Functions”, *Contemporary Mathematics*, 457, (2008), 127–133, ”Tapas in Experimental Mathematics”, AMS Special Session on Experimental Mathematics, January 5, 2007, New Orleans, LA, T. Amdeberhan and V. Moll editors.

32. M. Chamberland, “A Natural Extension of the Pythagorean Equation to Higher Dimensions”, *Ramanujan Journal*, 16, (2008), 169–179.
33. M. Chamberland, “The Collatz Chameleon”, *Biscuits of Number Theory, Dolciani Mathematical Expositions #34*, (2009), 217–222, Mathematical Association of America.
34. M. Chamberland, “Ramanujans 6-8-10 Equation and Beyond”, *Mathematics Magazine*, 82, (2009), 135–140.
35. M. Chamberland, K. Dilcher, “A binomial sum related to Wolstenholme’s theorem”, *Journal of Number Theory*, 129(11), (2009), 2659–2672.
36. M. Chamberland, A. Gasull, “Chini Equations and Isochronous Centers in Three-Dimensional Differential Systems”, *Qualitative Theory of Dynamical Systems*, 9, (2010), 29–38.
37. M. Chamberland and P. Lopatto. “Formulas for Odd Zeta Values and Powers of π ”, *Journal of Integer Sequences*, 14 (2011), article 11.2.5, 5pp.
38. E. Brown, M. Chamberland. “Generalizing Gauss’s Gem”, *American Mathematical Monthly*, 119(7), (2012), 597–601.
39. M. Chamberland. “Finite Trigonometric Product and Sum Identities”, *Fibonacci Quarterly*, 50(3), (2012), 217–221.
40. M. Chamberland. “Factored Matrices can Generate Combinatorial Identities”, *Linear Algebra and its Applications*, 438, (2013), 1667–1677.
41. M. Chamberland, C. Johnson, A. Nadeau, B. Wu. “Multiplicative Partitions”, *Electronic Journal of Combinatorics*, 20(2), (2013), #P57.
42. M. Chamberland, A. Straub. “On gamma quotients and infinite products”, *Advances in Applied Mathematics*, 51(5), 546–562 (2013).
43. M. Chamberland, D. Zeilberger. “A Short Proof of McDougalls Circle Theorem”, *American Mathematical Monthly*, 121(3), 263–265, (2014).
44. M. Chamberland. “Averaging structure in the $3x+1$ problem”, *Journal of Number Theory*, 148, 384–397, (2015).
45. M. Chamberland, E.A. Herman. “Rock-Paper-Scissors meets Borromean Rings”, *Mathematical Intelligencer*, 37(2), 20–25, (2015).

Refereed Journal Articles – Teaching

1. M. Chamberland. “The series for e via integration”, *College Mathematics Journal*, 30 (1999), 397.
2. M. Chamberland. “Proof Without Words – Slicing Kites into Circular Sectors”, *Mathematics Magazine*, 73 (2000), 363.
3. M. Chamberland. “Proof Without Words – Look Mom, No Substitution”, *Mathematics Magazine*, 74 (2001), 55.

Other Publications

1. M. Chamberland. “Spending the Weekend with a Model”, *Math Horizons*, November (2000), 16–19. Also appeared in *Grinnell Magazine*, 33 (spring 2001), 13–18.
2. M. Chamberland. “The Collatz Chameleon”, *Math Horizons*, November (2006), 5–9.
3. M. Chamberland. “The Putnam Challenge”, *Grinnell Magazine*, Winter (2007), 28–29.

Problem Section Contributions

1. Problem: “A Problem from Integral Geometry”, *SIAM Review*, 37 (1996), 610, Solution: *SIAM Review*, 38 (1996), 678–679.
2. Solution: “A Sequence of Composite Numbers”, *American Mathematical Monthly*, 111 (2004), 362–363.
3. Problem 11495, *American Mathematical Monthly*, 117 (2010), 370.

Unpublished Articles

1. M. Chamberland, G.M.L. Gladwell.
“Translation-Invariant Rotation-Invariant Spaces of Continuous Functions”,
<http://www.math.grin.edu/~chamberl/papers.html>.

Refereed Conference Presentations

1. M. Chamberland, V. Zeidan. “Second Order Necessity and Sufficiency Theory for the Free Final Time Problem”, Conference on Decision and Control, Arizona, 1992.
2. M. Chamberland. “Global Asymptotic Stability and the Jacobian Conjecture”, Third Geoffrey J. Butler Conference on Differential Equations and Population Biology, University of Alberta, 1996.
3. M. Chamberland. “Diffeomorphic Real-Analytic Maps and the Jacobian Conjecture”, Centennial Celebration, University of Nebraska-Lincoln, May 1998.

Non-refereed Conference Presentations

1. **1993, June.** “Basins of Attraction and Asymptotic Stability”, Comparison Methods and Stability Theory, University of Waterloo, Canada.
2. **1995, July.** “The Helmholtz Equation and Schiffer’s Conjecture”, SIAM International Congress in Industrial and Applied Mathematics, Hamburg, Germany.
3. **1997, May.** “A Mountain Pass to the Jacobian Conjecture”, Conference honoring the work of Gary Meisters, University of Nebraska-Lincoln.
4. **1998, January.** “A Dynamical Systems Approach to the $3x+1$ Problem”, Joint Meetings of the AMS-MAA, Baltimore.
5. **1998, April.** “Cubic Diophantine Equations”, MAA Iowa Section Meeting, Luther College, Iowa.
6. **1999, April.** “Jacobian Conjectures”, MAA Iowa Section Meeting, University of Iowa.
7. **1999, August.** “A Dynamical Systems Approach to the $3x + 1$ Problem”, International Conference on the Collatz Problem and Related Topics, Katholische Universität Eichstätt, Germany.
8. **2000, January.** “Iterated Strings and Cellular Automata”, Joint Meetings of the AMS-MAA, Washington, D.C.
9. **2000, April.** “The History and Current Status of the Collatz Conjecture”, MAA Iowa Section Meeting, Simpson College, Iowa.
10. **2001, August.** “The Jacobian Conjecture: Injectivity and Global Asymptotic Stability”, Mathematical Challenges of the 21st Century, University of California Los Angeles.

11. **2001, April.** “Decades of Iterated Strings”, MAA Iowa Section Meeting, Drake University, Iowa.
12. **2001, October.** “A Dynamical Systems Approach to the $3x+1$ Problem”, MAA Southern California Section Meeting (Invited Opening Speaker), Loyola Marymont University, California.
13. **2002, January.** “Generalized Ducci Sequences”, Joint Meetings of the AMS-MAA, San Diego.
14. **2002, June.** “Flows on Compact Two-Dimensional Manifolds”, First Joint Meeting of the AMS-UMI, June 2002, Pisa, Italy.
15. **2003, January.** “The Discrete Markus-Yamabe Problem with Nilpotent Jacobians”, Joint Meetings of the AMS-MAA, Baltimore.
16. **2003, April.** “Infinite Series for Logarithms using Cyclotomic Polynomials and Aurifeuillian Identities”, MAA Iowa Section Meeting, University of Northern Iowa.
17. **2004, January.** “Infinite Series for Logarithms using Cyclotomic Polynomials and Generalized Gaussian-Mersenne Primes”, Joint Meetings of the AMS-MAA, Phoenix.
18. **2004, April.** “Unbounded Orbits and Binary Digits”, MAA Iowa Section Meeting, Central College.
19. **2004, August.** “An Update on the $3x+1$ Problem”, Workshop on Analytic and Computational Number Theory, Dalhousie University, Halifax, Canada.
20. **2005, August.** “Dynamics of the Degree Six Landen Transformation”, Mathfest, Albuquerque.
21. **2005, August.** “The Collatz Chameleon”, Mathfest, Albuquerque.
22. **2006, January.** “The Many Faces of Pi”, MAA Student Lecture, Joint Meetings of the MAA-AMS, San Antonio.
23. **2006, April.** “Mathematics by Experiment”, MAA Iowa Section Meeting, Iowa State University.
24. **2006, August.** “The Mean-Median Map”, Mathfest, Knoxville.
25. **2007, January.** “PSLQ does Functions too!”, Joint Meetings of the MAA-AMS, New Orleans.
26. **2007, April.** “The Mean-Median Map”, MAA Iowa Section Meeting, Drake University.

27. **2008, August.** “Ramanujan’s Dream”, Mathfest, Madison.
28. **2009, January.** “Global Stability with Dulac Functions”, Joint Meetings of the MAA-AMS, Washington, D.C.
29. **2009, March.** “The Mean-Median Map”, AMS Meeting at the University of Illinois in Urbana-Champaign, Special Session on the Interface Between Number Theory and Dynamical Systems.
30. **2009, September.** “Beautiful Sums: from Ramanujan to Apéry”, Workshop on Discovery and Experimentation in Number Theory, Fields Institute for Research in Mathematical Sciences, Toronto, Canada.
31. **2010, June.** “Combinatorial Identities from LU Decomposition of Matrices”, 16th Conference of the International Linear Algebra Society, Pisa, Italy, June 2010.
32. **2011, January.** “Habits of Creative Mathematicians”, Joint Meetings of the MAA-AMS, New Orleans.
33. **2011, May.** “A Feast of Factoring”, A workshop on Computational and Analytical Mathematics, Simon Fraser University, Vancouver, May 2011.
34. **2012, January.** “A Course in Experimental Mathematics”, Joint Meetings of the MAA-AMS, Boston.
35. **2012, June.** “Multiplicative Partitions”, Canadian Number Theory Association XII Meeting, University of Lethbridge, Canada.
36. **2012, October.** “A Beautiful Cantor-Like Function”, MAA Iowa Section Meeting, Simpson College.
37. **2013, January.** “Complex Numbers and Geometry”, Joint Meetings of the MAA-AMS, San Diego.
38. **2014, January.** “Averaging Structure in the $3x + 1$ Problem”, Joint Meetings of the MAA-AMS, Baltimore.
39. **2014, October.** “Averaging Structure in the $3x + 1$ Problem”, Fall Eastern Sectional Meeting of the AMS, Dalhousie University, Halifax, Canada.
40. **2014, October.** “Finding and Proving BBP Series”, Fall Eastern Sectional Meeting of the AMS, Dalhousie University, Halifax, Canada.
41. **2015, October.** “Popularizing Mathematics with YouTube”, MAA Iowa Section Meeting, Graceland University, Lamoni, IA.
42. **2016, May.** “A Course in Experimental Mathematics”, Computationally Assisted Mathematical Discovery and Experimental Mathematics, University of Western Ontario, Canada.

43. **2016, June.** “Combinatorial Identities via Matrix Factorization”, 17th International Conference on Fibonacci Numbers and Their Applications, Université de Caen, France.
44. **2016, October.** “When Choice is an Illusion”, MAA Iowa Section Meeting, Grandview University, Des Moines, IA.
45. **2017, January.** “Combinatorial Identities via Matrix Factorization”, Joint Meetings of the MAA-AMS, Atlanta.
46. **2017, May** ”The Life and Legacy of Graham Gladwell”, 9th International Conference on Inverse Problems in Engineering, Waterloo, Canada.

Conferences Posters

1. “Experimental Mathematics”, MAA Poster Session on Projects Supported by the NSF Division of Undergraduate Education, Joint Meetings of the MAA-AMS, January 2009, MAA-AMS Joint Meetings, Washington, D.C.
2. “A Course in Experimental Mathematics”, MAA Poster Session on Projects Supported by the NSF Division of Undergraduate Education, Joint Meetings of the MAA-AMS, January 2010, MAA-AMS Joint Meetings, San Francisco.

Conferences/Workshops Organized

1. “International Conference on the Collatz Problem and Related Topics”, Katholische Universität Eichstätt, Germany, August 5–6, 1999.
2. “Workshop on Mathematical Modeling”, Pomona College, November 5–7, 2004.
3. “AMS-SIAM Special Session on Dynamics Equations on Time Scales; Integer Sequences and Rational Maps”, Joint Mathematics Meetings, Atlanta, January 2005.
4. AMS Special Session “Special Session on Experimental Mathematics in Number Theory, Analysis, and Combinatorics”, Halifax, Canada, October 2014.

Colloquium Talks

1. **1995, January.** “The Helmholtz Equation and Schiffer’s Conjecture”, McMaster University, Canada.
2. **1995, December.** “A Dynamical Systems Approach to the $3x + 1$ Problem”, York University, Canada.
3. **1996, May.** “A Dynamical Systems Approach to the $3x + 1$ Problem”, Calvin College, Michigan.
4. **1996, October.** “A Dynamical Systems Approach to the $3x+1$ Problem”, McMaster University, Canada.
5. **1996, December.** “A Dynamical Systems Approach to the $3x + 1$ Problem”, University of Ottawa, Canada.
6. **1997, February.** “Global Asymptotic Stability and the Jacobian Conjecture”, Calvin College, Michigan.
7. **1997, March.** “Global Asymptotic Stability and the Jacobian Conjecture”, McMaster University, Canada.
8. **1997, June.** “Global Asymptotic Stability and the Jacobian Conjecture”, University of Waterloo, Canada.
9. **1997, October.** “A Dynamical Systems Approach to the $3x+1$ Problem”, University of Nebraska-Lincoln.
10. **1998, April.** “A Dynamical Systems Approach to the $3x + 1$ Problem”, Macalester College, Minnesota.
11. **1998, July.** “A Dynamical Systems Approach to the $3x + 1$ Problem”, University of Waterloo, Canada.
12. **1999, March.** “A Dynamical Systems Approach to the $3x + 1$ Problem”, Iowa State University.
13. **1999, August.** “Jacobian Conjectures: Injectivity and Stability”, Katholische Universität Eichstätt, Germany.
14. **2000, October.** “Why Is Earning $\pounds 1100$ So Hard?”, Carleton College, Minnesota.
15. **2000, October.** “Jacobian Conjectures: Injectivity and Stability”, Carleton College, Minnesota.
16. **2001, October.** “Jacobian Conjectures: Flows and Maps”, Pomona College, California.
17. **2002, April.** “Flows on Compact Two-Dimensional Manifolds”, University of Waterloo, Canada.

18. **2002, April.** “A Dynamical Systems Approach to the $3x + 1$ Problem”, University of Nijmegen, Netherlands.
19. **2002, May.** “A Dynamical Systems Approach to the $3x + 1$ Problem”, Polytechnical University of Cataluña, Spain.
20. **2002, May.** “Jacobian Conjectures: Flows and Maps”, Universitat Autònoma de Barcelona, Spain.
21. **2002, May.** “Flows on Compact Two-Dimensional Manifolds”, Universitat Autònoma de Barcelona, Spain.
22. **2003, April.** “Jacobian Conjectures: Flows and Maps”, University of Washington in St. Louis.
23. **2004, June.** “The Many Faces of π ”, Iowa State University.
24. **2004, October.** “The Many Faces of π ”, Acadia University, Canada.
25. **2004, November.** “The Many Faces of π ”, Pomona College, California.
26. **2004, November.** “The Many Faces of π ”, California State Polytechnic University, Pomona.
27. **2005, March.** “Jacobian Conjectures: Flows and Maps”, Dalhousie University.
28. **2006, June.** “Mathematical Discovery via Experimental Mathematics”, Technische Universitaet Muenchen in Garching, Germany.
29. **2006, June.** “The $3x+1$ Problem: Status and History”, Universita di Trento, Italy.
30. **2006, July.** “Mathematical Discovery via Experimental Mathematics”, Forschungszentrum fuer Umwelt und Gesundheit, Institute for Biomathematics and Biometry, Germany.
31. **2007, March.** “The Many Faces of π ”, Carthage College, Wisconsin.
32. **2007, October.** “The Computer’s Role in Mathematical Discovery and Proof”, Tulane University, Louisiana.
33. **2008, January.** “The Computer’s Role in Mathematical Discovery and Proof”, Research Institute for Symbolic Computation, Linz, Austria.
34. **2009, March.** “Experiental Mathematics”, Trinity University, Texas.
35. **2009, August.** “The Computer’s Role in Mathematical Discovery and Proof”, University of Maine at Orono.

36. **2011, March.** “Chaos: Where Order meets Disorder”, Kelvin Lecture, Coe College.
37. **2012, November.** “The Computer’s Role in Mathematical Discovery and Proof”, Colorado College.
38. **2013, April.** “The Computer’s Role in Mathematical Discovery and Proof”, Westchester University.
39. **2013, April.** “A Feast of Experimental Mathematics”, Experimental Mathematics Seminar, Rutgers University.
40. **2013, April.** “The $3x+1$ Problem”, Rutgers University.
41. **2013, June.** “The $3x+1$ Problem”, Max Planck Institute fuer Mathematics, Bonn, Germany.
42. **2015, April.** “Habits of Creative Mathematicians”, McDougal Lecture, Lawrence University.

Talks to Student Groups and Non-mathematical Talks

- **1998, March.** “I have many [mathematical] problems”, MAA Iowa Section Math Contest, Grinnell College.
- **2001, October.** “I have many [mathematical] problems”, Claremont McKenna College.
- **2004, April.** “Have your π and eat it too!”, Grinnell College.
- **2007, February.** “The Gods Have Descended”, Lilly Lecture on Vocation, Grinnell College.
- **2007, July.** “Experimentation in Mathematics”, Pomona College.
- **2010, September.** “The Spidey Sense of a Mathematician”, Symposium on the Creative Process, College of Fine Arts, Illinois State University, Normal, IL.
- **2011, October.** “Creativity in Mathematics”, Brigham Young University.
- **2015, June.** “Secrets of Creativity: A Mathematician’s Perspective”, Grinnell College.
- **2016, June.** “Secrets of One to Nine”, Grinnell College.

- **2016, September.** “The Simplest Impossible Problem”, Grinnell College.
- **2016, September.** “Single Digits: The Wonders of One to Nine”, National Museum of Mathematics.

Juried Mathematical Art Exhibitions

- **2013, January.** “Inner Square”, Joint MAA-AMS Meetings, San Diego.
- **2013, July.** “Borromean Five”, Bridges 2013, Enschede, the Netherlands.
- **2014, January.** “Lorenz Attractor in Flow”, Joint MAA-AMS Meetings, Baltimore.
- **2016, August.** “Borromean Five”, Bridges 2016, Jyväskylä, Finland.

Referee for Journals

- American Mathematical Monthly
- Annals of Combinatorics
- Applied Mathematics & Information Sciences
- Ars Combinatoria
- Bulletin of the Brazilian Mathematical Society
- Canadian Journal of Mathematics
- College Mathematics Journal
- Contemporary Mathematics
- Discrete Mathematics
- Fibonacci Quarterly
- Indagationes Mathematicae
- INTEGERS
- International Journal of Applied Mathematics and Statistics
- International Journal of Mathematics and Mathematical Sciences

- International Journal of Number Theory
- Journal of Difference Equations and Applications
- Journal of Integer Sequences
- Journal of Mathematical Analysis and its Applications
- Journal of Number Theory
- Mathematics of Computation
- Mathematics Magazine
- Notices of the American Mathematical Society
- Proceedings of the American Mathematical Society
- Rocky Mountain Journal of Mathematics
- Scientific Annals of Computer Science
- SIAM Journal on Mathematical Analysis
- SIGMA (Symmetry, Integrability and Geometry: Methods and Applications)

Undergraduate Summer Research Students

1998 Anne Wilson

1999 Olesiy Andryichenko, Ian Besse

2000 Nicole Nelson, Dolph Robb

2001 Rajendra Magar, Daisuke Ueno, John Wray

2003 Andrea Brennen, Martha Makowski

2004 Jingkan Gu, Christine Oehlert

2007 Jon Cline, Halima Ilyas

2011 Colin Johnson, Alice Nadeau, Bingxi Wu

2015 David Koychev, Hannah Pham, Kaiqian Zhang

Undergraduate Research Experience

- **1986, January–August.** University of Waterloo, Canada.
 - Stokes Waves in Fluid Mechanics
 - Thermal Boundary Value Problems
 - supervisor: G. Tenti
- **1987, May–August.** University of Toronto, Canada.
 - Fluid Motion for Low Reynolds Number
 - Non-destructive Testing Analysis
 - supervisor: K.B. Ranger

Computer Programming Job Experience

- **1984, May–August.** WATCOM Inc., Waterloo, Canada.
- **1985, January–April, September–December.** Honeywell Inc., Toronto, Canada

Memberships

- American Mathematical Society (1988–)
- Mathematical Association of America (1998–)