

CURRICULUM VITAE

NAME: Philip Boyland

PRESENT POSITION: Professor

HOME ADDRESS: Department of Mathematics
University of Florida
Gainesville, Florida 32611

BORN: Philadelphia, Pennsylvania
June 22, 1953

DEGREES: B.A., magna cum laude,
Middlebury College - 1975
Ph.D., University of Iowa - 1983

RESEARCH INTERESTS: Dynamical Systems, Classical
and Fluid Dynamics

PROFESSIONAL EXPERIENCE:

University Term Professor, 2017-2020, Professor, 2009-current, Associate Professor, 2000-2009,
Assistant Professor, 1997-2000, Mathematics Department, University of Florida, Gainesville.
Mathematician in Residence, Department of Theoretical and Applied Mechanics, University of
Illinois, Urbana, 1995-1997
Visiting Instructor, Mathematics Department, University of Illinois, Urbana, Fall 1995-1997
Assistant Professor, Institute for Mathematical Sciences, SUNY at Stony Brook, Fall 1991-1995
Technical writing and graphics programming, Wolfram Research, Inc., August 1990 - July 1991
Research Fellow, Institute for Mathematics and its Applications, Minneapolis, Winter, 1990
Visiting Assistant Professor, University of Minnesota, Minneapolis, Winter 1990
Visiting Assistant Professor, Northwestern University, Fall 1989
Postdoctoral Research Fellow, Mathematical Sciences Research Institute, Berkeley, August 1988 -
August 1989
Assistant Professor, Maharishi International University, 1986-1990
Assistant Professor, Boston University, 1983-1986

TEACHING:

Developed and taught starting in Spring 20 the upper division undergraduate course “Linear Algebra for Data Science” for the new Data Science major

Taught graduate course on Surface Dynamics at the Instituto de Matemática e Estatística, University of São Paulo, September 2015 - December 2015, 3 hours a week. Resulted in course notes for a book.

Spring, 1997 (with H. Aref) integrated course in Engineering Dynamics and Differential Equations, joint initiative of Mathematics and Theoretical and Applied Mechanics Departments.

Developed upper level graduate courses in (1) the use of computers for research in Pure Mathematics (Topics in Symbolic and Numerical Analysis) and (2) Dynamical Systems Theory (Dynamics of Surface Homeomorphisms).

Courses taught: **Graduate two semester sequences**; Ergodic Theory and Dynamical Systems, Topology, Complex Variable, Numerical Linear Algebra and Analysis. **Undergraduate**; Calculus 1, 2, 3, Differential Equations, Advanced Differential Equations, Complex Analysis, Numerical Analysis, Topology, Fractal Geometry, Linear Algebra, Linear Algebra for Data Science, Applied Fourier Analysis

AWARDS:

The paper “Topological methods in surface dynamics” published in 1994 was recognized by the journal in October 2005 as one of the 10 most highly cited publications to appear in *Topology and its Applications*

GRANTS AND FELLOWSHIPS:

Pesquisador Visitante Especial (Special Visiting Researcher), 2015-2018, \$250,000 BRL (approx \$100,000 USD). Includes salary for three visits up to three months each, travel expenses, a postdoc in Brazil, and graduate student travel to UF from Brazil. Funded by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Higher Education Personnel Training Coordination) in the Ministry of Education of Brazil.

Visiting Fellow, Programme Topological Dynamics in the Physical and Biological Sciences, July 16–December 12, 2012, Isaac Newton Institute for Mathematical Sciences. Cambridge, UK.

Pesquisador Visitante (Visiting Researcher), funded by Fundação de Amparo à Pesquisa do Estado de São Paulo, and spent in residence at the Instituto de Matemática e Estatística of the University of São Paulo, R\$51,219, September 5, 2010 to March 5, 2011.

PI of “Ulam Centennial and Spring Topology and Dynamical Systems Conference 2009”, NSF DMS-0844136*, 2008-2009, \$49,117.

PI of “Collaborative Research: Topological Fluid Mechanics of Stirring”, NSF DMS-0604570, 2006-2009, joint award with Mark Stremler from the Department of Mechanical Engineering at Vanderbilt University from NSF Mathematics/Applied Mathematics Program, \$ 154,146 (this is the UF portion, each PI submits a separate budget),

PI of “Thurston-Nielsen Theory and Fluid Mixing”, DMS-9870323, 1998-2002, \$78,000, funded by the Applied Mathematics Program of the NSF.

Co-PI (with R. Moser of University of Illinois, Dept. of Theoretical and Applied Mechanics) of “Controlling Turbulence as a Chaotic System”, total funds \$240,000, of that \$101,360 comes to University of Florida as a subcontract from the University of Illinois, funded by NSF Engineering Program, Division of Chemical and Transport Systems as CTS-9729189, 1998-2002.

Faculty Associate (summer salary and travel), NSF grant #431-4591-A, 1992-1994.

Research Fellow, Institute for Mathematics and Its Applications, January-April, 1990.
Postdoctoral Research Fellow, MSRI, Berkeley, August 1988-August 1989.

EDITORSHIPS & REFEREEING ACTIVITIES:

Associate Editor, São Paulo Journal of Mathematical Sciences, October 2016 – current
Editor (one of three) of the proceedings of the International Union of Theoretical and Applied Mechanics Conference on Helicity, Structures and Singularity in fluid and plasma dynamics, Istituto Veneto, Venice, April 11-16, 2016 to appear in *Fluid Dynamics Research*.

Managing Editor (one of 6) of *Topology and its Applications*, 2007–2011.

Journal Refereeing: *Dynamical Systems, Inventiones mathematicae, Topology and its Appl., Non-linearity, Journal of Nonlinear Science, Journal of Fluid Mechanics Colloquium Mathematicum, MAA Monthly, IMA Journal of Applied Mathematics, Monatshefte fuer Mathematik, Ergodic Theory and Dynamical Systems, Discrete and Continuous Dynamical Systems, Proceedings of the NAS, Journal of the LMS, Transactions of the AMS, Memoirs of the AMS, Proceedings of the AMS, Chaos, Proceedings of the LMS, Mathematical Proceedings of the Cambridge Philosophical Society, Journal of Mathematical Physics, Mathematical Modeling, Physica D. Phys. Rev. E, Experimental Mathematics, Rocky Mountain Journal of Mathematics, SIAM Journal of Applied Dynamical Systems, Indiana Journal of Mathematics, Geometry and Topology.*

Publisher Refereeing: Princeton University Press, John Wiley & Sons, Inc, SIAM Press, Springer Verlag.

Funding Agency Refereeing: National Science Foundation, Engineering and Physical Sciences Research Council (UK), Cooperative Grants Program of the U.S. Civilian Research and Development Foundation, London Mathematical Society Fellowships.

OTHER PROFESSIONAL ACTIVITIES:

Outside member of PhD committee of João Paulo Ferreira de Mello, University of São Paulo, final defence on May 19, 2023

Outside member of PhD committee of Everton Juliano da Silva, University of São Paulo, final defence on June 1, 2019.

Outside member of PhD committee of Marcel Vinhas Bertolini, University of São Paulo, final defence on April 20, 2016.

Scientific Committee, International Union of Theoretical and Applied Mechanics Conference on Helicity, Structures and Singularity in fluid and plasma dynamics, Istituto Veneto, Venice, April 11-16, 2016.

Outside member of PhD committee of Juan Valentin Mendoza Mogollon, University of São Paulo, final defence on February 17, 2011.

Chair of Organizing Committee and PI of NSF grant for the Ulam Centennial and 43rd Annual Spring Topology and Dynamical Systems Conference to take place in March, 2009 in Gainesville.

Invited co-organizer of Special Session in Dynamical Systems at the Summer Topology Conference, July 2005, Dennison University.

Invited co-organizer of Special Session on Topological Fluid Dynamics at the International Congress of Theoretical and Applied Mechanics, August 2004, Warsaw, Poland.

Invited co-organizer of Special Session in Dynamical Systems at the Spring Topology and Dynamics Conference, March 2004, Birmingham Alabama.

Co-organizer, Midwest Dynamical Systems Meeting, March 2000, Gainesville, FL.

THESES AND DISSERTATIONS DIRECTED:

Christopher Strickland, “Bifurcations of the degree-two standard family of circle maps”, Masters in Applied Mathematics, August 2006.

Jason Harrington, “Topological efficiency of stirring protocols”, PhD in Mathematics, December, 2010.

Aaron Smith, “Markov chain statistics for quantifying mixing”, PhD in Mathematics, August, 2010.

William Severa, “Geometric representation of the infimax S-adic family”. PhD in Mathematics, August, 2015,

DEPARTMENTAL SERVICE:

Webmaster, 2012-present

Chair, Colloquium and Visitors Committee, 2011-present.

Co-Director, Center for Applied Mathematics, 2007-present.

Chair, Hiring Committee, 2020-2021

Chair, Department Chair Search Committee, 2012-2013, 2017-2018.

Member of Department Chair Search Committee, 2006-2007.

Steering Committee, 2001-2003, 2005-2007 (Speaker 2006-2007).

Chair, Thompson-Chandler PostDoc Search Committee, 2007-2008.

Chair, Group Proposals Committee, 2002-2003, 2004-2005, 2007-2008.

Chair, Hiring Plan Committee, 2003-2004, 2005-2006, 2008-2009.

Self-Study and External Review, 2005-2006: coordinated Faculty CV’s, group presentations and production of printed and electronic materials.

UNIVERSITY SERVICE:

CLAS Finance Committee, 2011–2012, 2013-2017

CLAS Computational Sciences Committee, March 2004 - 2007.

PUBLICATIONS:

41. *Dynamical displacements, persistence and semiconjugacies*, Banach Center Publications.
40. Philip Boyland, André de Carvalho and Toby Hall, *Unimodal Measurable Pseudo-Anosov Maps*, preprint.
39. Philip Boyland, André de Carvalho and Toby Hall, *The Dynamics of Measurable Pseudo-Anosov Maps*, preprint.
38. Philip Boyland, *On the abundance of k -fold semi-monotone minimal sets in bimodal circle maps*, Ergodic Theory and Dynamical Systems, to appear.
37. Philip Boyland, André de Carvalho and Toby Hall, *Natural extensions of unimodal maps: virtual sphere homeomorphisms and prime ends of basin boundaries*, Geometry and Topology **25** (2021), 111-228.
36. Philip Boyland, André de Carvalho and Toby Hall, *Statistical Stability for Barge-Martin attractors derived from tent maps*, Discrete and Continuous Dynamical Systems A **40** (2020), 2903-2915.
35. Philip Boyland, André de Carvalho and Toby Hall, *Typical path components in tent map inverse limits*, Fundamenta Mathematicae **250** (2020).
34. Philip Boyland, André de Carvalho and Toby Hall, *Itineraries for inverse limits of tent maps: a backwards view*, Topology and its Applications **232** (2017), 15-50.
33. Philip Boyland and William Severa, *Geometric representation of the infimax S -adic family*, Fundamenta Mathematicae **240** (2018), 27 pages.
32. Philip Boyland, André de Carvalho and Toby Hall, *New Rotation Sets in a Family of Torus Homeomorphisms*, Inventiones Mathematicae **204** (2016), 895-937.
31. Philip Boyland, André de Carvalho and Toby Hall, *On digit frequencies in β -expansions*, Trans. AMS **368** (2016), 8633-8674.
30. Philip Boyland, André de Carvalho and Toby Hall, *Lexicographic minimax sequences*, Ergodic Theory and Dynamical Systems **35** (2015), 2371–2396.
29. *Exponential growth in two-dimensional topological fluid dynamics*, Procedia IUTAM **7** (2013), 107–116.
28. Philip Boyland, André de Carvalho and Toby Hall, *Inverse limits as attractors in parameterized families*, Bull. London Math. Soc. **45** (2013), 1075–1085.
27. Philip Boyland and Jason Harrington, *The entropy efficiency of point-push mapping classes on the punctured disk*, Algebraic & Geometric Topology **11** (2011), 2265 - 2296.
26. *On eigen-structures for pseudoAnosov maps*, (posted on arXiv.org as arXiv:1009.2932), 53 pages.
25. *Transitivity of Surface Dynamics Lifted to Abelian Covers*, Ergodic Theory and Dynamical Systems **29**, no. **5** (2009), 1417–1449.
24. Gavin Band and Philip Boyland, *The Burau estimate for the entropy of a braid*, Algebraic & Geometric Topology, **7** (2007), 1345–1378.
23. *Semiconjugacies to angle-doubling*, Proc. AMS **134** (2006), 1299–1307.
22. *Dynamics of two-dimensional time-periodic Euler fluid flows*, Topology and its Application **152** (2005), 87–106.
21. V. Lopez, P. Boyland, M. Heath, and R. Moser, *Relative periodic orbits for the Complex Ginzburg-Landau equation*, SIAM Journal on Applied Dynamical Systems **4** (2005), 1042–1075.
20. P. Boyland, H. Aref and M. Stremler, *Topological fluid dynamics of point vortex motions*, Physica D **175** (2003), 69–95.
19. *Fluid Mechanics and Mathematical Structures in*, An Introduction to the Geometry and Topology of Fluid Flows (ed. R.L. Ricca), NATO-ASI Series: Mathematics. Kluwer, (2001), 105–134.

18. *New dynamical invariants on hyperbolic manifolds*, Israel Journal of Math **119** (2000), 253–289.
17. (with H. Aref and M. Stremler), *Topological fluid dynamics of stirring*, Journal Fluid Mechanics **403** (2000), 277–304.
16. (with H. Aref, M. Stremler and D. Vainchtein), *Turbulent Statistical Dynamics of a System of Point Vortices in*, Fundamental Problematic Issues in Turbulence, A. Gyr, W. Kinzelbach and A. Tsinober eds., Trends in Mathematics, Birkhäuser (1999), 151–161.
15. *Isotopy stability for dynamics on surfaces*, Contemp. Math. **246** (1999), 17–46.
14. (with T. Hall), *Isotopy stable dynamics relative to compact invariant sets*, Proceedings London Math. Soc. **79** (1999), 673–693.
13. (with C. Golé), *Lagrangian systems on hyperbolic manifolds*, Ergod. Th. & Dynam. Sys. **19** (1999), 1157–1173.
12. (with C. Golé), *Dynamical stability in Lagrangian systems*, in Hamiltonian Systems with Three or More Degrees of Freedom, C. Simó, editor. NATO Adv. Sci. Inst. Ser. C Math. Phys. Sci Kluwer Acad. Publ., Dordrecht, Holland, 1999.
11. *Dual billiards, twist maps and impact oscillators*, Nonlinearity **9** (1996), 1411–1438.
10. *Topological methods in surface dynamics*, Topology and its Applications **58** (1994), 223–298.
9. *Weak disks of Denjoy minimal sets*, Ergod. Th. & Dynam. Sys. **13** (1993), 597–614.
8. (with J. Guaschi and T. Hall), *L'ensemble de rotation des homéomorphismes pseudo-Anosov*, C. R. Acad. Sci. Paris. Sér I Math. **316** (1993), 1077–1080.
7. *Rotation sets and topological monotone orbits for annulus homeomorphisms*, Comm. Math. Helv. **67** (1992), 203–213.
6. *The rotation set as a dynamical invariant*, Proceedings of the IMA Workshop on Twist Maps, IMA Volumes in Mathematics and its Applications, Springer Verlag **44** (1992), 73–86.
5. *An analog of Sharkovski's Theorem for twist maps*, Cont. Math. **81** (1988), 119–133.
4. *Rotation sets and Morse decompositions for twist maps*, Ergod. Th. & Dynam. Sys. **8*** (1988), 33–61.
3. *Invariant circles and rotation bands in monotone twist maps*, Comm. Math. Phys. **113** (1987), 67–77.
2. (with G.R. Hall), *Invariant circles and the order structure of periodic orbits in monotone twist maps*, Topology **26** (1987), 21–36.
1. *Bifurcations of circle maps: Arnol'd tongues, bistability and rotation intervals*, Comm. Math. Phys. **106** (1986), 353–381.

INVITED CONFERENCE TALKS, COLLOQUIA, and SEMINARS:

- “When Topology forces dynamics’, minicourse, 8 x 25 minutes, Banach Center, April 11-21, 2023, Warsaw, Poland.
- “When Topology forces dynamics’, minicourse, 5 x 25 minutes, Jagiellonian University, April 3-5, 2023, Krakow, Poland.
- “When Topology forces dynamics”, plenary lecture, Summer Topology Conference, July 22, 2022, University of Vienna, Austria.
- “On measurable pseudoAnosov maps”, Virtual Dynamics Seminar, April 13, 2021, AGH, Krakow, Poland.
- “On measurable pseudoAnosov maps”, Virtual Dynamics Seminar, April 22, 2021, University of Vienna, Austria.
- “On measurable pseudoAnosov maps”, Virtual Dynamics Seminar, April 26, 2021, University of Manchester, England.

Minicourse on “Braids and Dynamics”, Summer School on the topology of flows, July 19-23, 2020. Haifa, Israel, canceled due to the pandemic.

Surface Dynamics, September 6-12, Mathematisches Forschungsinstitut Oberwolfach, canceled due to the pandemic.

“Two results regarding the natural measure on tent map inverse limits”, 2019 Spring Topology and Dynamics Conference, University of Alabama at Birmingham, March, 2019.

“Typical path components in tent map inverse limits”, Dynamical Systems Seminar, University of Liverpool, June, 2017

“When topology forces dynamics”, joint Colloquium at University of Warwick Mathematics Department and plenary talk at the Dynamics of Complex Systems Conference (MacKay60), May, 2016.

“Geometric representation of the infimax S-adic family”, Dynamics Seminar, University of São Paulo, April, 2016.

“Families of homeomorphisms with inverse limit attractor”, Three lecture minicourse joint with Toby Hall, Workshop on Dynamical Systems and Continuum Theory, University of Vienna, June 29 - July 3 2015.

“Dynamics lifted to Abelian covers”, Plenary talk, Dubrovnik VIII - Geometric Topology, Geometric Group Theory & Dynamical Systems, June 25, 2015.

“New rotation sets in a family of torus homeomorphisms”, Dynamics Seminar, Montana State University, March 4, 2015.

“Topology, Tangling and Fluid Mixing”, College of Letters and Science’s Distinguished Speakers Series, Montana State University, March 5, 2015.

“New rotation sets in a family of torus homeomorphisms”, plenary talk, Surfaces in São Paulo, University of São Paulo, 7 - 11 April, 2014.

“New rotation sets in a family of torus homeomorphisms”, plenary talk, Semi-annual Workshop in Dynamical Systems and Related Topics, Penn State University, October 17 - 20, 2013.

“Exponential growth in two-dimensional fluid mechanics”, Semi-plenary talk, Summer Topology Conference, Nipissing University, July 23-26, 2013.

“The entropy efficiency of stirring protocols”, Special Session on New Trends in Topology, Summer Topology Conference, Nipissing University, July 23-26, 2013.

“Rotation sets for beta-shifts and toral homeomorphisms”, Dynamical Systems Seminar, Imperial College, London, December 13, 2012

“The Markov and homological spectrum in surface dynamics”, Dynamical Systems Seminar, University of Liverpool, November 30, 2012

“Two-dimensional topological fluid dynamics”, Mathematics Department Colloquium, University of Liverpool, November 30, 2012

“Rotation sets for beta-shifts and toral homeomorphisms”, Dynamical Systems Seminar, University of Warwick, November 27, 2012

“Optimizing and two-dimensional topological measure of mixing”, Dynamical Systems Seminar, University of São Paulo, November 13, 2012

“Exponential growth in two-dimensional topological fluid dynamics”, Numerical Analysis Seminar, University of Durham, October 26, 2012

“Optimizing and two-dimensional topological measure of mixing”, Dynamical Systems Seminar, Leeds, October 23, 2012

“Two-dimensional topological fluid dynamics”, Mathematics Department Colloquium, University of Leeds, October 23, 2012

- “Exponential growth in two-dimensional topological fluid dynamics”, plenary talk, Topological Fluid Dynamics (IUTAM Symposium), Issac Newton Institute, Cambridge, England, July 23, 2012
- “Topology and exponential growth in two-dimensional Euler flow”, Mini-symposium on On Solutions to the Euler Equations of Incompressible Fluids, 6th European Congress of Mathematics, Kraków, Poland, July 5, 2012
- “Topics in two-dimensional topological fluid dynamics”, plenary talk at Frontiers in Dynamical systems and Topology at the Research Institute for Mathematical Sciences, Kyoto University, November 21, 2011
- “The homological and Markov spectra in surface dynamics”, plenary talk at Frontiers in Dynamical systems and Topology at the Research Institute for Mathematical Sciences, Kyoto University, November 24, 2011
- “Eigen-structures for Pseudo-Anosov Maps”, plenary talk at First International Conference in Topological Methods in Dynamics, May 30-June 3, 2011, Universidade Estadual de Campinas.
- “Topological Efficiency of Braids”, plenary talk at Workshop de Topologia & Dinâmica 2011, Universidade Federal Fluminense Niteri, Rio de Janeiro, February 21-25, 2011.
- “Topics in topological fluid dynamics”, Colloquium, Mathematics Department, Universidade de São Paulo, October 22, 2010.
- “The homological and Markov spectra in surface dynamics”, November EDAI session (EDAI is a three university dynamics consortium in Rio which holds a monthly mini-conference), Pontifcia Universidade Catlica do Rio de Janeiro, November 5, 2010.
- “The homological and Markov spectra in surface dynamics”, three lecture minicourse in the Dynamics seminar at Universidade de São Paulo, began October 1, 2010.
- “Entropy Efficiency of Braids”, Special Session on Dynamics, Spring Topology and Dynamics Conference, Mississippi State University, March 18-20, 2010.
- “The homological and Markov spectra in surface dynamics”, Dynamics seminar at Universidade Estadual de Campinas, November 26, 2010.
- Special Session on Dynamical Systems, First Joint Meeting of the American Mathematical Society and the Sociedade Brasileira de Matemática, Rio de Janeiro, Brazil, June, 2008.
- Special Session on Dynamical Systems, Spring Topology and Dynamics Conference, Milwaukee, March, 2008.
- Dynamical Systems Seminar, Imperial College, London, May, 2007.
- Colloquium, University of Liverpool, May, 2007
- Special session on Dynamical Systems, Spring Topology and Dynamics Conference, University of Missouri, Rolla, April, 2007.
- Computational and topological aspects of dynamics, Lorentz Center, Leiden University, Netherlands, May 2006.
- University of Houston, Mathematics Department Colloquium, February, 2006.
- 20th Summer Conference on Topology and its Applications, Special Session in Dynamical Systems, Dennison University, July 10-13, 2005.
- Spring Topology Conference, Berry College, GA, March 2005.
- Science Seminar Series, Daytona Beach Community College, March 2005.
- Midwest Dynamical Systems Meeting, University of Cincinnati, October 2004.
- Special Session on Fluid Mixing, 21st International Congress of Theoretical and Applied Mechanics, Warsaw, Poland, August 2004.
- Special Session on Dynamical Systems, Sixth International Joint Meeting of the AMS and the Sociedad Matemática Mexicana, Houston, TX, May 2004.

Colloquium, Dept. of Mathematics, Florida State University, March 2004.

SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, May 2003.

Dynamical Systems Conference, University of North Texas, May, 2003.

Applied Math Seminar, University Of Illinois, Urbana, January, 2003.

Colloquium and Dynamical Systems Seminar, Montana State, May, 2002.

Midwest Dynamical Systems Conference, Asheville, NC, March, 2002.

Sixteenth Florida Workshop on Nonlinear Astronomy, February 2001.

Dynamical Systems Seminar, Mathematics Department, University of Manchester, Dec. 13, 2000.

Colloquium, Basic Research Institute in the Mathematical Sciences (BRIMS) at Hewlett-Packard Laboratories, Bristol, U.K., Nov. 29, 2000. This lecture is available in Real Media format on the web at:
<http://www.hpl.hp.co.uk/brims/websems/colloq00/boyland/sem.html>.

Dynamical Systems Seminar, Mathematics Dept., University of Warwick, Nov. 29, 2000.

Conference on Differential Geometry and Global Analysis in Fluid Dynamics and Dynamical System, BRIMS Days, 2000 (affiliated with the Basic Research Institute in the Mathematical Sciences (BRIMS) of Hewlett-Packard Laboratories), Newton Institute, Cambridge, UK, Nov. 20-21, 2000.

Special Session on Dynamics and Low-Dimensional Topology, AMS Southeastern Section Meeting, November 10-12, 2000, Birmingham, Alabama.

Colloquium, Newton Institute, Cambridge, UK, Nov. 6, 2000.

Colloquium, Mathematics Dept., University of Liverpool, Nov.3, 2000.

Dynamical Systems Seminar, Dept. of Pure Mathematics and Mathematical Statistics, University of Cambridge, Nov. 2, 2000.

Applied Mathematics Seminar, Imperial College, London, Nov. 1, 2000.

Fluid Mechanics Seminar, Dept. of Applied Mathematics and Theoretical Physics, University of Cambridge, Oct. 27, 2000.

Two lectures at the Pedagogical Workshop on Geometry and Topology of Fluid Flows (a NATO Advanced Study Institute), Newton Institute, Cambridge, U.K., Sept. 11-22, 2000.

Hamiltonian Mechanics and Small Divisors in Partial Differential Equations, International Centre for Mathematical Science, Edinburgh, May, 1999.

Nonlinear Sciences Seminar, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, May, 1999.

Principal speaker, Dynamics Days, Georgia Tech, January, 1999.

Special Session on Topology and Dynamics, AMS Meeting, Winston-Salem, NC, October, 1998.

U.S. National Congress of Applied Mechanics, June 1998, Gainesville, Florida, (contributed refereed paper).

Laminations and foliations in dynamics, geometry and topology, Stony Brook, New York, May 1998.

Plenary speaker, Global Analysis 30 Years Later, University of Cincinnati, March 1998.

Plenary speaker, Spring Topology and Dynamics Conference, George Mason University, March 1998.

Thermal Science and Engineering Seminar, Mechanical Engineering Dept., University of Florida, Feb.1998.

Special Session on The Topology & Dynamics of Low-Dimensional Flows, AMS meeting, Georgia Tech., October 1997.

Colloquium, Department of Aerospace Engineering, Mechanics & Engineering Science, University of Florida, Sept. 1997.

Colloquium and Dynamical Systems Seminar, University of Cincinnati, April 1997.
 Midwest Dynamical Systems Conference, Austin, TX, March 1997.
 Dynamical Systems Seminar, Northwestern University, November 1996.
 Division of Fluid Dynamics of the American Physical Society, Syracuse, November 1996 (contributed refereed paper).
 Dynamics Seminar, Universitat de Barcelona, June 1995.
 Dynamics Seminar, Centre de Recerca Matemàtica, Institut d'Estudis Catalans, June 1995.
 Dynamics and Ergodic Theory Seminar, Université Paris-Nord, May 1995.
 Northeast Dynamics Conference, Hartford, Connecticut, April 1995.
 Dynamical Systems Seminar, CUNY Graduate Center, April 1995.
 Midwest Dynamical Systems Conference, Minneapolis, March 1995.
 Dynamical Systems Seminar, University of Texas, Austin, February 1995.
 (5 lecture mini-course) Montana State, October 1994.
 (4 lecture mini-course) Summer Conference on General Topology and Applications, Amsterdam, August 1994.
 Dynamical Systems Seminar, Northwestern University, March 1994.
 Joint Spring Topology/Southeast Dynamical Systems Conference, Auburn University, March 1994.
 Special Session on Algebraic Topology and Dynamical Systems, AMS Annual Meeting, Cincinnati, January 1994.
 Low Dimensional Dynamics, Mathematisches Forschungsinstitut Oberwolfach, April 1993.
 Analysis Seminar, ETH, Zurich, April 1993.
 Dynamical Systems Seminar, Universitat Autònoma de Barcelona, April 1993.
 Dynamical Systems Seminar, CUNY Graduate Center, March 1993.
 Special Session on Small Divisor Problems in Nonlinear Analysis, AMS Annual Meeting, San Antonio, January 1993.
 Special Session on Low Dimensional Geometric Dynamical Systems, AMS Annual Meeting, San Antonio, January 1993.
 Dynamical Systems Seminar, Boston University, October 1992.
 Dynamical Systems and Related Topics, Pennsylvania State University, October 1992.
 Joint AMS-SIAM Summer Research Conference on Nielsen Theory and Dynamical Systems, South Hadley, MA, June 1992.
 Workshop on the Dynamics of 4-dimensional Symplectic Maps, Geometry Center, Minneapolis, March 1992.
 Colloquium, Adelphi University, February 1992.
 Dynamical Systems Seminar, Boston University, January 1992.
 Midwest Dynamical Systems Meeting, Fall 1991, Bozeman, MT, 1991.
 Dynamical Systems Seminar, CUNY Graduate Center, November 1991.
 Special Session on Continuum Theory and Dynamical Systems, AMS Summer Meeting, Orono, ME, August 1991.
 Regional Institute for Dynamical Systems, Boston University, July 1991.
 Dynamical Systems Seminar, Northwestern University, October 1990.
 Mini-symposium on Recent Mathematical Developments in Chaotic Dynamics, SIAM Annual Meeting, Chicago, July 1990.
 Dynamical Systems Seminar and Topology Seminar, University of Texas, Austin, April 1990.
 Twist Maps Workshop, Institute for Mathematics and its Applications, Minneapolis, March 1990.
 Dynamics and Mechanics Seminar, Institute for Mathematics and its Applications, Minneapolis, January 1990.

Dynamical Systems Seminar, Northwestern University, October 1989.
 Dynamische Systeme, Mathematisches Forschungsinstitut Oberwolfach, July 1989.
 (10 lecture mini-course), Workshop on Braid Types, University of Warwick, June 1989.
 Joint AMS-SIAM Summer Research Conference on the Relationship Between Continuum Theory
 and the Theory of Dynamical Systems, Arcata, CA, June 1989.
 The Geometry of Hamiltonian Systems, Mathematical Sciences Research Institute, Berkeley, CA,
 June 1989.
 Dynamical Systems Seminar, Northwestern University, February 1989.
 Symplectic Geometry Seminar, Mathematical Sciences Research Institute, Berkeley, CA, February
 1989.
 Dynamical Systems Seminar, University of California, Berkeley, December 1988.
 London Mathematical Society Summer Research Symposium on Dynamical Systems, Durham,
 June 1988.
 Joint AMS-SIAM Summer Research Conference on Hamiltonian Dynamical Systems, Boulder, CO,
 June 1987.
 Dynamical Systems Seminar, University of Warwick, April 1987.
 Dynamical Systems Seminar, King's College, Cambridge University, April 1987.
 Midwest Dynamical Systems Meeting, Evanston, IL, Spring 1986.
 Dynamical Systems Seminar, Princeton University, March 1986.
 Applied Analysis and Dynamical Systems Colloquium, Boston University, April 1985.
 Dynamical Systems Seminar, CUNY Graduate Center, December 1984.
 Topology Seminar, Princeton University, November 1984.
 Two Manifolds Workshop, Mathematical Sciences Research Institute, Berkeley, CA, October 1984.
 Topology and Dynamical Systems Conference, Mathematical Sciences Research Institute, Berkeley,
 CA, June 1984.
 Applied Analysis and Dynamical Systems Colloquium, Boston University, April 1984.
 Midwest Dynamical Systems Meeting, Madison, WI, Spring 1984.
 Special Session on Dynamical Systems, Summer AMS Meeting, Albany, NY, 1983.
 Midwest Dynamical Systems Meeting, Boulder, CO, Spring 1983.