

# Mark Francis Demers

## Curriculum Vitae

Professor of Mathematics  
Department of Mathematics  
Fairfield University  
Fairfield, CT 06824

Phone: (203) 254-4000 ext. 2252  
Email: [mdemers@fairfield.edu](mailto:mdemers@fairfield.edu)  
[www.faculty.fairfield.edu/mdemers](http://www.faculty.fairfield.edu/mdemers)

### Education

- Courant Institute**, New York University, Ph.D. in Mathematics. 1998-2003  
Awarded M.S. in Mathematics, May 2001.
- Amherst College**, B.A. *Magna Cum Laude* in Mathematics and English. 1990-1994

### Research Interests

Statistical properties of dynamical systems; ergodic theory; open systems and escape rates; billiards and related models from mathematical physics.

**Doctoral Thesis Advisor:** Dr. Lai-Sang Young

**Thesis Title:** *Markov Extensions and Conditionally Invariant Measures for Dynamical Systems with Holes.*

### Academic Appointments

- Professor**, Department of Mathematics 2017 – present  
Fairfield University
- Associate Professor**, Department of Mathematics 2011 – 2017  
Fairfield University, Connecticut.
- Assistant Professor**, Department of Mathematics and Computer Science 2006 – 2011  
Fairfield University, Connecticut.
- Visiting Scholar**, Courant Institute, New York University January – May 2009
- Postdoctoral Fellow**, Mathematical Sciences Research Institute January – May 2007  
Berkeley, California.
- Visiting Assistant Professor**, School of Mathematics 2003 – 2006  
Georgia Institute of Technology, Georgia.

### Grants, Honors, Fellowships

- National Science Foundation Research Grant** 2018-2021  
PI: Award amount \$245,423. Proposal title: *RUI: Nonuniformly hyperbolic dynamical systems out of equilibrium.*

- National Science Foundation Research Grant** 2014-2018  
 PI: Award amount \$168,500. Proposal title: *RUI: Statistical properties of nonequilibrium and extended dynamical systems.*
- Wall Award Recipient**, Fairfield University. 2016-2017  
 Research award granting one semester paid leave for focused research.
- Research-in-Pairs Grant**, Centre International de Rencontres Mathématiques August 2017  
 Grant providing full local support to conduct focused research for 2 weeks at CIRM, Luminy, France, with two other mathematicians. Grant awarded in September 2015.
- Professeur Invité**, École Normale Supérieure, Paris, France. April 2016
- Visiting Professor**, University of Toulon and Centre for Theoretical Physics, June – July 2014  
 University of Aix-Marseille, Luminy Campus, France.
- Visiting Researcher**, University of Rome, Tor Vergata, Rome, Italy. April 2014
- Research in Groups Grant**, International Centre for Mathematical Sciences March 2014  
 Awarded £7,000 to conduct research for 1 month at ICMS in Edinburgh, Scotland, with a group of 3 other mathematicians.
- Visiting Fellow**, Research Semester in Mathematics for the Fluid Earth November 2013  
 Isaac Newton Institute, Cambridge University, UK.
- National Science Foundation Research Grant** 2011 – 2014  
 PI: Award amount \$130,000. Proposal title: *RUI: Open, coupled and extended dynamical systems with nonuniform hyperbolicity.*
- Visiting Professor**, Semester in “Hyperbolic dynamics, large deviations and fluctuations,” Centre Interfacultaire Bernoulli, EPFL, Lausanne, Switzerland. May – June 2013
- National Science Foundation Research Grant** 2008 – 2011  
 PI: Award amount \$108,086. Proposal title: *Topics in Dynamical Systems: Open systems, coupled systems and discretization.*
- London Mathematical Society Research Grant** May – June 2011  
 Awarded Scheme 2 grant of £2,000 to visit 3 universities in the UK to foster potential collaborations.
- Faculty Research Award**, Fairfield University Spring 2010
- Science Institute Grant**, Fairfield University 2009  
 Co-wrote grant to sponsor a general audience mathematics lecture at Fairfield.
- Visiting Researcher**, Semester in Hyperbolic Dynamics May - June 2008  
 Erwin Schrödinger Institute for Mathematical Physics, Vienna, Austria.
- Visiting Researcher**, Centro Ennio de Giorgi, May - July 2006  
 Collegio Puteano, Scuola Normale Superiore, Pisa, Italy.
- Visiting Researcher**, Trimester "Time at Work," May - June 2005  
 Institut Henri Poincaré, Paris, France.

**Research Grant**, University of Rome, Tor Vergata, Rome, Italy.

June 2004

**Submitted Research Papers** (See <http://www.faculty.fairfield.edu/mdemers/research/pub.html>)

1. V. Baladi and M.F. Demers, *On the measure of maximal entropy for finite horizon Sinai billiard maps*.

**Journal Publications** (See <http://www.faculty.fairfield.edu/mdemers/research/pub.html>)

All publications are peer-reviewed.

1. M.F. Demers, *A gentle introduction to anisotropic Banach spaces*, Chaos, Solitons and Fractals **116** (2018), 29-42.
2. M.F. Demers, L. Rey-Bellet and H.-K. Zhang, *Fluctuation of the entropy production for the Lorentz gas under small external forces*, Comm. Math. Phys. **363**:2 (2018), 699-740.
3. H. Bruin, M.F. Demers and M. Todd, *Hitting and escaping statistics: mixing, targets and holes*, Advances in Math. **328** (2018), 1263-1298.
4. V. Baladi, M.F. Demers and C. Liverani, *Exponential decay of correlations for finite horizon Sinai billiard flows*, Inventiones Math. **211**:1 (2018), 39-177.
5. M.F. Demers and M. Todd, *Slow and fast escape for open intermittent maps*, Comm. Math. Phys. **351**:2 (2017), 775-835.
6. M.F. Demers, C. Ianzano, P. Mayer, P. Morfe, and E. Yoo, *Limiting distributions for countable state topological Markov chains with holes*, Discrete and Contin. Dynam. Sys. **37**:1 (2017), 105-130.
7. M.F. Demers and M. Todd, *Equilibrium states, pressure and escape for multimodal maps with holes*, Israel Journal of Mathematics **221**:1 (2017), 367-424.
8. M.F. Demers and B. Fernandez, *Escape rates and singular limiting distributions for intermittent maps with holes*, Trans. Amer. Math. Soc. **368**:7 (2016), 4907-4932.
9. M.F. Demers and H.-K. Zhang, *Spectral analysis of hyperbolic systems with singularities*, Nonlinearity **27** (2014), 379-433.
10. M.F. Demers, *Escape rates and physical measures for the infinite horizon Lorentz gas with holes*, Dynamical Systems: An International Journal **28**:3 (2013), 393-422
11. M.F. Demers, *Dispersing billiards with small holes*, in *Ergodic theory, open dynamics and coherent structures*, W. Bahsoun, C. Bose and G. Froyland, eds. Springer Proceedings in Mathematics & Statistics. Springer: New York (2014), 137-170.

12. M.F. Demers and H.-K. Zhang, *A functional analytic approach to perturbations of the Lorentz gas*, Communications in Mathematical Physics **324**:3 (2013), 767-830.
13. M.F. Demers and P. Wright, *Behavior of the escape rate function in hyperbolic dynamical systems*, Nonlinearity **25** (2012), 2133-2150.
14. M.F. Demers and H.-K. Zhang, *Spectral analysis of the transfer operator for the Lorentz gas*, Journal of Modern Dynamics **5**:4 (2011), 665-709.
15. M.F. Demers, P. Wright and L.-S. Young, *Entropy, Lyapunov exponents and escape rates in open systems*, Ergodic Theory and Dynamical Systems **32**:4 (2012), 1270-1301.
16. M.F. Demers, *Functional Norms for Young Towers*, Ergodic Theory and Dynamical Systems **30**:5 (2010), 1371-1398..
17. M.F. Demers, P. Wright and L.-S. Young, *Escape rates and physically relevant measures for billiards with small holes*, Communications in Mathematical Physics **294** (2010), 353-388.
18. H. Bruin, M.F. Demers and I. Melbourne, *Existence and convergence properties of physical measures for certain dynamical systems with holes*, Ergodic Theory and Dynamical Systems **30** (2010), 687-728.
19. M.F. Demers and M.P. Wojtkowski, *A family of pseudo-Anosov maps*, Nonlinearity, **22** (2009), 1743-1760.
20. M.F. Demers and C. Liverani, *Stability of statistical properties in two-dimensional piecewise hyperbolic maps*, Trans. Amer. Math. Soc. **360**:9 (2008), 4777-4814.
21. M.F. Demers and L.-S. Young, *Escape rates and conditionally invariant measures*, Nonlinearity, **19** (2006), 377-397.
22. L.A. Bunimovich and M.F. Demers, *Deterministic models of the simplest chemical reactions*, Journal of Statistical Physics **120** (2005), 239-252.
23. M.F. Demers, *Markov extensions and conditionally invariant measures for certain logistic maps with small holes*, Ergodic Theory and Dynamical Systems **25**:4 (2005), 1139-1171.
24. M.F. Demers, *Markov extensions for dynamical systems with holes: an application to expanding maps of the interval*, Israel Journal of Mathematics **146** (2005), 189-221.

### Scientific Visits

1. University of Rome, Tor Vergata, Italy, March 2017 (Prof. Liverani)
2. Université de Paris VI, France, February 2017 (Prof. Baladi)
3. Erwin Schrödinger Institute for Mathematics and Physics, Vienna, Austria, May 2016 (program on Mixing Flows and Averaging Methods)

4. École Normale Supérieure, Paris, France, April 2016 (Prof. Baladi)
5. University of Houston, March 2015 (Prof. Zhang)
6. École Normale Supérieure, Paris, France, September 2014 (Prof. Baladi)
7. University of Aix-Marseille, Luminy Campus CPT, France, July 2014 (Prof. Vaienti)
8. University of Rome, Tor Vergata, Italy, April 2014 (Prof. Liverani)
9. University of Copenhagen, Denmark, August 2013 (Prof. Baladi)
10. École Polytechnique Fédérale de Lausanne, Switzerland, May-June 2013 (Program in hyperbolic dynamics, large deviations and fluctuations)
11. University of Vienna, Austria, May 2013, (Prof. Bruin)
12. University of Rome, Tor Vergata, Italy, May 2012 (Prof. Liverani)
13. University of Brest, France, May 2012 (Profs. Penne and Saussol)
14. University of Bristol, England, June 2011 (Prof. Dettman)
15. University of Surrey, England, May 2011 (Prof. Melbourne)
16. Loughborough University, England, May 2011 (Prof. Bahsoun)
17. University of Massachusetts at Amherst, August 2010 (Prof. Zhang)
18. University of Porto, Porto, Portugal, May-June 2009 (Prof. Alves)
19. University of Rome, Tor Vergata, Italy, May 2009 (Prof. Liverani)
20. Erwin Schrödinger Institute for Mathematics and Physics, Vienna, Austria, May-June 2008 (Program in hyperbolic dynamics)
21. Centro Ennio di Giorgi, Scuola Normale Superiore, Pisa, Italy, May-July 2006 (Prof. Marmi)
22. Institut Henri Poincaré, Paris, France, May-June 2005 (Program in ergodic theory)
23. University of Surrey, Guildford, England, May 2005 (Profs. Melbourne and Bruin)
24. University of Rome, Tor Vergata, Italy, June 2004 (Prof. Liverani)

### **Professional Memberships and Service**

**Editorial Board:** Associate Editor, Discrete and Continuous Dynamical Systems – Series A  
Associate Editor, Nonlinearity

**Conferences Organized:**

1. *New Developments in Open Dynamical Systems and Their Applications*, March 2018  
Banff International Research Station, Canada.
2. *International Conference on Statistical Properties of Nonequilibrium Dynamical Systems*, July 27 – August 2, 2016  
South University of Science and Technology of China, Shenzhen, China. Conference preceded by three-week workshop offering minicourses for young researchers and students, July 4 – July 26, 2016.
3. *Stochastic methods for nonequilibrium dynamical systems*, June 1 – 5, 2015  
Workshop held at the American Institute of Mathematics, Palo Alto, California.

**Journal Referee:** Annales de l'Institut Henri Poincaré  
 Communications in Mathematical Physics  
 Discrete and Continuous Dynamical Systems  
 Ergodic Theory and Dynamical Systems  
 Journal of Modern Dynamics  
 Journal of Physics A: Mathematical and Theoretical  
 Journal of Statistical Physics  
 Monatshefte für Mathematik  
 Nonlinearity  
 Physica D: Nonlinear Phenomena  
 Real Analysis Exchange  
 Revista Matemática Complutense  
 Transactions of the American Mathematical Society

**Member:** American Mathematical Society  
 Pi Mu Epsilon (Mathematical Honor Society)

**Other Work and Teaching Experience**

**Graduate Assistant**, New York University. 1998-2003  
 1 year served as Teaching Assistant; 4 years served as lead instructor.

**Instructor**, Marymount College, Tarrytown, NY. Summer 1999  
 Taught College Algebra summer course.

**Vice Principal of Academic Affairs**, Saramen Chuuk Academy, Micronesia. 1996 - 1997  
 Coordinated school-wide effort to help teachers create curriculum guides for high school course sequences. Evaluated teacher performance through classroom visits and individual conferences. Organized after-school program for at-risk students. Wrote successful grant proposal to expand language lab for freshman English Skills.

**Teacher**, Saramen Chuuk Academy, Chuuk State, Micronesia. 1994-1997  
 Taught mathematics and English literature and composition to high school juniors and seniors as a member of the Jesuit International Volunteers program.