

Daniel M. Abrams

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Professional preparation

Massachusetts Institute of Technology (Cambridge, MA) Postdoctoral Research Fellow in Mathematical Sciences Department of Earth, Atmospheric and Planetary Sciences	2006–2009
Cornell University (Ithaca, NY) Ph.D. in Theoretical and Applied Mechanics, May 2006	2001–2006
California Institute of Technology (Pasadena, CA) Bachelor of Science with honors in Applied Physics, June 2000	1996–2000

Appointments and honors

Northwestern University Department of Engineering Sciences and Applied Mathematics <i>Associate Professor</i>	2015–Present
Northwestern Institute on Complex Systems (NICO) <i>Faculty member, member of executive committee 2015–present</i>	2011–Present
Northwestern University Department of Physics and Astronomy <i>Faculty member (by courtesy)</i>	2013–Present
Northwestern University Department of Engineering Sciences and Applied Mathematics <i>Assistant Professor</i>	2009–2015
James S. McDonnell Foundation <i>Scholar, Complex Systems</i>	2010–2015
Northwestern University Searle Center for Teaching Excellence <i>Searle Fellow</i>	2011–2012
Fulbright Program / Council for International Exchange of Scholars <i>Visiting Scholar, UNSAAC University Department of Physics, Cusco, Peru</i>	2010
NSF / MIT Department of Earth, Atmospheric, and Planetary Sciences <i>Mathematical Sciences Postdoctoral Research Fellow</i>	2006–2009
NSF East Asia and Pacific Summer Institute Fellow (SNU, Seoul, Korea)	Summer 2006
NSF Graduate Research Fellow	2003–2006
US ED Foreign Language Area Study Grantee (Quechua)	Summer 2003
Field Research Fellow, US Antarctic Program Project S-157 (Ice Stream C, Antarctica)	2000–2001
Eagle Scout	1996

Selected publications (10) Total cites = 2599, h-index = 16 (Google Scholar, 11/30/2017)

- 1) T. Kotwal, X. Jiang, and D.M. Abrams, "Connecting the Kuramoto model and the chimera state," *Physical Review Letters*, in press (2017). [*journal article, accepted*]
- 2) S.M. Clifton, R.I. Braun, and D.M. Abrams, "Handicap principle implies emergence of dimorphic ornaments," *Proceedings of the Royal Society B* **283**, 1970 (2016). [[doi:10.1098/rspb.2016.1970](https://doi.org/10.1098/rspb.2016.1970)] [*journal article, published*]
- 3) S.H. Lee, R. Ffranco, D.M. Abrams, B.J. Kim and M.A. Porter, "Matchmaker, matchmaker, make me a match: Migration of populations via marriages in the past," *Physical Review X* **4**, 041009 (2014). [[doi:10.1103/PhysRevX.4.041009](https://doi.org/10.1103/PhysRevX.4.041009)] [*journal article, published*]
- 4) D.M. Abrams, A. Slawik, and K. Srinivasan, "Nonlinear oscillations and bifurcations in silicon photonic microresonators," *Physical Review Letters* **112**, 123901 (2014). [[doi:10.1103/PhysRevLett.112.123901](https://doi.org/10.1103/PhysRevLett.112.123901)] [*journal article, published*]
- 5) M.J. Panaggio and D.M. Abrams, "Chimera states on a flat torus," *Physical Review Letters* **110**, 094102 (2013). [[doi:10.1103/PhysRevLett.110.094102](https://doi.org/10.1103/PhysRevLett.110.094102)] [*journal article, published*]
- 6) D.M. Abrams, H.A. Yapple, and R.J. Wiener, "Dynamics of social group competition: Modeling the decline of religious affiliation," *Physical Review Letters* **107**, 088701 (2011). [[doi:10.1103/PhysRevLett.107.088701](https://doi.org/10.1103/PhysRevLett.107.088701)] [*journal article, published*]
- 7) A.P. Petroff, O. Devauchelle, D.M. Abrams, A.E. Lobkovsky, A. Kudrolli, and D.H. Rothman, "Geometry of valley growth," *Journal of Fluid Mechanics* **673**, 245–254 (2011). [[doi:10.1017/S002211201100053X](https://doi.org/10.1017/S002211201100053X)] [*journal article, published*]
- 8) D.M. Abrams, A.E. Lobkovsky, A.P. Petroff, K.M. Straub, B. McElroy, D.C. Mohrig, A. Kudrolli, and D.H. Rothman, "Growth laws for channel networks incised by groundwater flow," *Nature Geoscience* **2**, 193–196 (2009). [[doi:10.1038/ngeo432](https://doi.org/10.1038/ngeo432)] [*journal article, published*]
- 9) S.H. Strogatz, D.M. Abrams, F.A. McRobie, B. Eckhardt, and E. Ott, "Crowd synchrony on the Millennium Bridge," *Nature* **438**, 43 (2005). [[doi:10.1038/438043a](https://doi.org/10.1038/438043a)] [*journal article, published*]
- 10) D.M. Abrams and S.H. Strogatz, "Modelling the dynamics of language death," *Nature* **424**, 900 (2003). [[doi:10.1038/424900a](https://doi.org/10.1038/424900a)] [*journal article, published*]

Synergistic activities

Teaching and training:

- Worked with School of the Art Institute of Chicago on new collaborative course "Data as art" (2013).
- Developed new course material (including problems drawn from research) while teaching "Modeling Coupled Oscillators and Sync," "Models in Applied Math," "Methods of Applied Math," "Engineering Analysis 4," and "Vector Calculus" at Northwestern (2009-2017), "Nonlinear Physics" at UNSAAC (Peru, 2010), "Modeling in Environmental Geoscience" at MIT (2008).
- Mentored 13 undergraduate and 8 graduate student researchers (ongoing).
- Co-editor-in-chief of SIAM Dynamical Systems magazine and DSWeb web site (2016-present).

Development of research tools:

Created and distributed numerical simulation notes and code: coupled oscillator systems (2008), chaotic Taylor-Couette fluid system (2002).

Development of databases to support research and education:

Compiled shared databases on language competition (2003-2004), evolution of religious affiliation (2010-2011), handedness in athletics (2011), international smoking dynamics (2014), and US obesity dynamics (2017).

Broadening participation of underrepresented groups:

- Lectured on math, science, computer skills, and the US educational system at civil institutions in Bolivia, Peru, and Nicaragua (2003-2010). Translated large portions of book "Nonlinear Dynamics and Chaos" into Spanish (2010).
- Participated in Schuler Scholar Outreach Program to promote math to underserved high school students (2013-2015).
- Panelist for Graduate Research Opportunities for Women (GROW) conference for undergraduate women in math (2016, 2017).

Current research grant support

Current:

NSF DMS-1547394, Research Training Grant: \$1,429,870.00 (5 years: co-PI) <i>RTG: Interdisciplinary Training in Quantitative Biological Modeling</i>	2016–Present
NSF AST-1359462, REU Site: \$2,877,794.00 (3 years: research mentor / co-PI) <i>Preparing a Diverse Workforce through Interdisciplinary Astrophysics Research</i>	2014–Present
NICO Data Science Initiative grant #1195: \$30,000.00 (1 year: co-PI) <i>Sociophysics of Political Elections</i>	2017–Present