

Curriculum Vitae

I. Personal Information

I.A. UID: , Girvan, Michelle

Bldg 223, Paint Branch Dr
College Park, MD 20742

I.B. Academic Appointments at UMD

University of Maryland, Associate Professor, July 2013 - Present
Joint appointment between the Department of Physics (50%) and the Institute for Physical Science and Technology (50%).

University of Maryland, Assistant Professor, January 2007 - June 2013

I.D. Other Employment

Institute for Advanced Study, Member, September 2008 - July 2009

Santa Fe Institute, Postdoctoral Fellow, September 2003 - December 2006

I.E. Educational Background

Ph.D. in Physics, Cornell University (Ithaca, NY), January 2004. Dissertation title: The Structure and Dynamics of Complex Networks: A Statistical Physics and Dynamical Systems Approach.

B.S. in Physics and B.S. in Mathematics with a minor in Political Science, Massachusetts Institute of Technology, (Cambridge, MA), June 1999.

II. Research, Scholarly and Creative Activities

II.C. Articles in Refereed Journals

Full citation, inclusive of all authors in the order of publication and page numbers. Review articles and invited articles should be so identified. Optional: include DOI.

(intellectual leader or co-leader, † graduate student mentored by MG, ‡ undergraduate student mentored by MG, ^ postdoc mentored by MG)*

K. Glass, and M. Girvan*. "Finding New Order in Biological Functions from the Network Structure of Gene Annotations." *PLoS Comput Biol* 11.11 (2015): e1004565.

A. Melchionna‡, J. Caloca‡, S. Squires, T.M. Antonsen, E. Ott, and M. Girvan* "Impact of imperfect information on network attack." *Physical Review E* 91, no. 3 (2015): 032807.

W.L. Ku†, M. Girvan, and E. Ott*. "Dynamical transitions in large systems of mean field-coupled Landau-Stuart oscillators: Extensive chaos and cluster states." *Chaos: An Interdisciplinary Journal of*

Nonlinear Science 25.12 (2015).

A. Zitin[‡], A. Gorowara[‡], S. Squires[†], M. Herrera[†], T.M. Antonsen, M. Girvan* and E. Ott*, “Spatially embedded growing small world networks,” *Scientific Reports* 4, 7047 (2014).

K. Glass[†] and M. Girvan*, “Annotation Enrichment Analysis: An Alternative Method for Evaluating the Functional Properties of Gene Sets,” *Scientific Reports* 4, 4191 (2014).

S. Squires[†], A. Pomerance, M. Girvan*, and E. Ott*, “Stability of Boolean networks: The joint effects of topology and update rules,” *Physical Review E* 90 (2), 022814 (2014).

M. Mailman[^], M. Harrington, M. Girvan*, and W. Losert*, “Consequences of Anomalous Diffusion in Disordered Systems under Cyclic Forcing,” *Physical Review Letters* 112 (22), 228001 (2014).

T.R. Kieβling, M. Herrera, K.D Nnetu, E.M. Balzer, M. Girvan, A.W. Fritsch, S.S. Martin, J.A. Käs, and W. Losert*, "Network Based Biomechanical Phenotyping of Circulating Tumor Cells," *European Biophysics Journal* 42 (5), 383-394 (2013).

D. Darmon[†], J. Sylvester, M. Girvan*, and W. Rand*, “Understanding the Predictive Power of Computational Mechanics and Echo State Networks in Social Media.” *ASE Human Journal*, vol. 2(2), pp. 13–24. (2013).

J. Platig[†], E. Ott, M. Girvan*, "Robustness of network measures to link errors" *Physical Review E* 88 (6), 062812 (2013).

W.L. Ku[†], M. Girvan, G.C. Yuan, F. Sorrentino, E. Ott*, "Modeling the dynamics of bivalent histone modifications," *PloS one* 8 (11), e77944, 2013.

S. Squires[†], K. Sytwu, D. Alcalá, T.M. Antonsen, E. Ott, M. Girvan*, "Weakly explosive percolation in directed networks," *Physical Review E* 87 (5), 052127, 2013

K. Glass[†] and M. Girvan*, "Annotation Enrichment Analysis: An Alternative Method for Evaluating the Functional Properties of Gene Sets," *Scientific Reports*, accepted for publication (2013).

S. Squires[†], E. Ott, and M. Girvan*, “Dynamical Instability in Boolean Networks as a Percolation Problem,” *Phys. Rev. Lett.* 109, 085701 (2012).

S. Chauhan[†], M. Girvan*, and E. Ott*, “A network function-based definition of communities in complex networks,” *Chaos* 22, 033129 (2012).

K. Glass[†], E. Ott, W. Losert, and M. Girvan*, “Implications of functional similarity for gene regulatory interactions,” *J. R. Soc. Interface*, rsif20110585 (2012).

W. L. Ku[†], G. Duggal[†], Y. Li, M. Girvan*, and E. Ott*, “Interpreting patterns of gene expression: signatures of coregulation, the data processing inequality, and triplet motifs,” *PLoS ONE* 7(2), e31969 (2012).

A. Pomerance*, M. Girvan*, and E. Ott*, “Stability of Boolean networks with generalized canalizing rules,” *Phys. Rev. E* 85, 046106 (2012).

- D. Anderson[‡], A. Tenzer[‡], G. Barlev, M. Girvan, T.M. Antonsen*, and E. Ott*, “Multiscale dynamics in communities of phase oscillators,” *Chaos* 22, 013102 (2012).
- S. Slotterback, M. Mailman[^], K. Ronaszegi, M. van Hecke, M. Girvan, and W. Losert*, “Onset of irreversibility in cyclic shear of granular packings,” *Phys. Rev. E* 85, 021309 (2012).
- M. Herrera[†], S. McCarthy[^], S. Slotterback, E. Cephas[‡], W. Losert, and M. Girvan*, “Path to fracture in granular flows: Dynamics of contact networks,” *Phys. Rev. E* 83, 061303 (2011).
- C.P. Kempes[†], G.B. West, K. Crowell, and M. Girvan*, “Predicting maximum tree heights and other traits from allometric scaling and resource limitations,” *PLoS ONE* 6(6), e20551 (2011).
- J. Stout[‡], M. Whiteway[‡], E. Ott*, M. Girvan*, and T.M. Antonsen*, “Local synchronization in complex networks of coupled oscillators,” *Chaos* 21, 025109 (2011).
- O. Peters* and M. Girvan*, “Universality under conditions of self-organization,” *J. Stat Phys.* 141, 53-59 (2010).
- G. Barlev[‡], M. Girvan*, and E. Ott*, “Map model for synchronization of systems of many coupled oscillators,” *Chaos* 20, 023109 (2010).
- A. Pomerance[†], E. Ott*, M. Girvan*, and W. Losert*, “The effect of network topology on the stability of discrete state models of genetic control,” *Proc. Natl. Acad. Sci. USA* 106, 8209-8214 (2009).
- S. Chauhan[†], M. Girvan*, and E. Ott*, “Spectral properties of networks with community structure,” *Phys. Rev. E* 80, 056114 (2009).
- T. M. Antonsen*, R. Faghih[‡], M. Girvan*, E. Ott*, and J. Platig[‡], “External periodic driving of large systems of globally coupled phase oscillators,” *Chaos* 18, 037112 (2008).
- E. Ott*, J. Platig[‡], T.M. Antonsen Jr, and M. Girvan, “Echo phenomena in large systems of coupled oscillators,” *Chaos* 18, 037115 (2008).
- J.C. Flack*, M. Girvan*, F.B.M. de Waal, and D.C. Krakauer*, “Policing stabilizes construction social niches in primates.” *Nature* 439, 426-429 (2006).
- D. Wiley, S.H. Strogatz*, and M. Girvan, “The size of the sync basin,” *Chaos* 16, 015103 (2006).
- M.E.J. Newman* and M. Girvan*, “Finding and evaluating community structure in networks,” *Phys. Rev. E* 69, 026113 (2004).
- M. Girvan* and M.E.J. Newman*, “Community structure in social and biological networks,” *Proc. Natl. Acad. Sci. USA* 99, 8271-8276 (2002).
- M. Girvan, D.S. Callaway, M.E.J. Newman, and S.H. Strogatz*, “A simple model of epidemics with pathogen mutation,” *Phys Rev. E* 65, 031915 (2002).

M.E.J. Newman*, M. Girvan*, and J.D. Farmer, "Optimal Design, robustness, and risk aversion," *Phys. Rev. Lett.* 89, 028301 (2002).

E.M. Jin, M. Girvan, and M.E.J. Newman*, "The structure of growing social networks," *Phys. Rev. E* 64, 046132 (2001).

II.D. Published Conference Proceedings

II.D.1. Refereed Conference Proceedings

J. Harada, D. Darmon†, M. Girvan*, and W. Rand*. "Forecasting High Tide: Predicting Times of Elevated Activity in Online Social Media." In *Proceedings of the 2015 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining 2015*, pp. 504-507. ACM, 2015.

H. Wang, G. Duggal, R. Patro, M. Girvan, S. Hannenhalli, C. Kingsford*, "Topological properties of chromosome conformation graphs reflect spatial proximities within chromatin," *Proceedings of the International Conference on Bioinformatics, Computational Biology and Biomedical Informatics*, ACM, 2013.

D. Darmon†, J. Sylvester, M. Girvan*, and W. Rand*. "Understanding the Predictive Power of Computational Mechanics and Echo State Networks in Social Media." *ASE Human Journal*, vol. 2(2), pp. 13–24 (2013).

G. Duggal†, S. Navlakah, M. Girvan*, and C. Kingsford*, "Uncovering many views of biological networks using ensembles of near-optimal partitions," *MultiClust: 1st International Workshop on Discovering, Summarizing and Using Multiple Clusterings at KDD* (2010).

II.D.2. Non-Refereed Conference Proceedings

M. E. J. Newman* and M. Girvan, "Mixing patterns and community structure in networks," *Proceedings of the XVIII sitges Conference on Statistical Mechanics*, Springer Verlag, Berlin (2003).

II.E. Conferences, Workshops, and Talks

II.E.1. Keynotes

Clarence Clay Memorial Lecture, Complex Systems Seminar Series, University of Wisconsin, Madison, October 2013

Keynote address, Undergraduate Mathematics Conference, George Mason University, April 2013

II.E.2. Invited Talks

NetSci International Conference, Zaragoza, Spain, June 2015

SIAM Conference on Applications of Dynamical Systems, May 2015

Applied Mathematics Colloquium, Northwestern University, May 2015

Big Data Seminar, Harvard University School of Public Health, April 2015

NetSci International Conference, Satellite on "Theory and Applications in Connectivity Transitions in

Networked Systems”, Berkeley, CA, June 2014
Seminar, Laboratory for Telecommunication Studies, College Park, MD, February 2014
Network Frontier Workshop, Northwestern University, January 2013
Physics Colloquium, University of Binghamton, NY, September 2013
Workshop: Structure, Statistical Inference, and Dynamics in Networks, Santa Fe Institute, May 2013
Center for Bioinformatics and Computational Biology, UMCP, seminar, December 2012
Dynamics Days Asia-Pacific, Taipei, Taiwan, August 2012
George Mason University, Physics Colloquium, March 2012.
APS ‘March’ Meeting, Frontiers in Granular Physics session, February 2012.
University of Maryland, Advanced Network Colloquium, December 2011.
Vienna Austria, European Conference on Complex Systems, November 2011.
George Mason University, Social Complexity Seminar, October 2011.
Mining and Learning with Graphs at KDD, August 2011.
Duke University, Mathematical Biology Seminar, March 2011.
North Carolina State University, Biophysics Colloquium, March 2011.
The College of William and Mary, Applied Science Colloquium, November 2010.
European Dynamics Days, Bristol, England, September 2010.
SAMSI (Statistical and Applied Mathematical Sciences Institute) Complex Networks Workshop,
August 2010.
Columbia University Biomedical Informatics Seminar, February 2010.
Shih-I Pai Seminar, University of Maryland, December 2009.
Howard University Physics Colloquium, November 2009.
Harvard Medical School Computational Biology Seminar, October 2009.
Princeton Computer Science Colloquium, April 2009.
Applied Dynamics Seminar, University of Maryland, April 2009.
Dynamics Days International Conference, UC San Diego, January 2009.
Princeton Economic-Sociology Seminar, October 2008.
Northwestern Complex Systems Conference, May 2008.
CSCAMM seminar, University of Maryland, November 2007.
Ecological Networks Conference, Colorado State University, April 2007.
Colloquium in Mechanical Engineering, Yale University, February 2007.
Systems biology seminar, NIST, February 2007.
Statistical Physics seminar, University of Maryland, February 2007.
Physics seminar, University of Rome, May 2006.
Colloquium in Advanced Modeling Concepts in Environmental Science, UC Davis, November 2005.
Deacon Innovation Public Lecture, Melbourne Town Hall, Australia, May 2005.
Physics colloquium, Northwestern University, March 2005.
Dynamics Days International Conference, UC Irvine, January 2005.
Fudan-SFI workshop on biocomplexity, Shanghai, China, May 2004.

Neural Information Processing Systems (NIPS) Conference, Whistler, British Columbia, December 2003.

Nonlinear Dynamics and Complex Systems Seminar, University of Illinois at Urbana-Champaign, November 2003.

II.E.3. Refereed Presentations

European Conference on Complex Systems, Vienna, Austria, November 2011

International Conference on Complex Systems, Boston, MA, June 2011

II.J. Sponsored Research

List source, title, amount awarded, time period and role (i.e. principal investigator or co-investigator) in reverse chronological order or its inverse. If there are co-investigators, please list these.

II.J.1. Grants

National Science Foundation

(2/15/2015 - 2/28/2018)

“Research Experiences for Undergraduate (REU) Site- Training and Research Experiences in Nonlinear Dynamics”

Role: PI

Amount: \$355,917

National Science Foundation

“Collective Rotation Networks in Dense Granular Flow

Experiments: Connecting Rotation and Translation across Scales”

(4/1/15-3/31/18)

Role: Co-PI

Amount: \$ 449,934

Army Research Office

(5/1/2012 - 4/30/2017)

“The Role of Network Structure in Discrete State Systems”

Role: Co-PI

Amount: \$543,000

National Institutes of Health (subcontract from Carnegie Mellon University)

“Managing Uncertainty in Chromosome Conformation Capture Data”

(9/23/13-9/22/17)

Role: Co-PI

Amount: \$ 454,919

DARPA (subcontract from STTR award to Perceptronics Solutions)

“Heterogeneous Analysis of Group Interactions & Dynamics (HAGID) for Social Media”

(6/30/14-1/22/16)

Amount: \$330,000

National Science Foundation

(3/1/2012 - 2/28/2015)

“Research Experiences for Undergraduate (REU) Site- Training and Research Experiences in Nonlinear Dynamics”

Role: PI

Amount: \$354,000

National Science Foundation

(8/15/2009 - 07/31/2012)

NSF Division of Materials Research: “Dynamic Contact Networks in Granular Systems: New Insights Into Fracture and Segregation”

Role: Co-PI

Amount: \$345,000

National Science Foundation

(12/1/2011 - 9/30/2012)

“Conference: Dynamics Days 2012”

Role: PI

Amount: \$15,000

Office of Naval Research

(12/1/2011 - 9/30/2012)

“Conference: Dynamics Days 2012”

Role: PI

Amount: \$20,000

Army Research Office

(9/15/2011 - 9/14/2012)

“Conference: Dynamics Days 2012”

Role: PI

Amount: \$25,000

UMIACS Frontier Seed Grant

(1/1/2011 - 12/31/2011)

“Computational Approaches for Identifying Folding Principles of Eukaryotic Genomes”

Role: Co-PI

Amount: \$50,000

II.J.2. Contracts

Northrop Grumman Research Contract

(5/1/2012 - 12/31/2012)

“Social Network Analysis”

Role: PI

Amount: \$30,000

Northrop Grumman Research Contract

(12/1/2009 - 11/31/2011)

“Social Network Analysis”

Role: PI

Amount: \$100,000

II.K. Fellowships, Gifts and Other Funded Research

II.K.3. Other

Microsoft Research Award
One time award. June 2007.
Modularity, Differentiation, and Contagion in Network Data
Role: PI
Amount: \$50,000

II.L. Submissions and Works in Progress

List press, journal, or granting agency.

II.L.1. Current Grant Applications

Support: Pending
Project/Proposal Title: NRT-DESE: Network Biology: From Data to Information to Insights
Source of Support: NSF, NRT-DESE
Total Award Amount: \$ 2,999,847.00
Total Award Period Covered: 9/1/16-8/31/21
Location of Project: University of Maryland College Park
Person-Months Per Year Committed to the Project: 1 Cal month

II.L.2. Manuscripts in Preparation

II.L.3. Manuscripts under Review (*indicate status: submitted or revising to resubmit*)

III. Teaching, Mentoring and Advising.

III.A. Courses Taught

PHYS 165: Intro to Programming for the Physical Sciences (Spring 2008 - 23 students, Spring 2011 - 18 students, Spring 2012 - 17 students, Spring 2013 - , Fall 2013)
PHYS 260: General Physics: Oscillations, Fluids, Waves, Heat and Electricity (Spring 2010 - 61 students, Fall 2011 - 164 students, Fall 2012 – 16 students)
PHYS 615: Nonlinear Dynamics of Extended Systems (Fall 2007 - 16 students, Fall 2009 - 20 students, Fall 2010 - 15 students, Spring 2014 -18 students).

III.B. Teaching Innovations

III.B.5. Course or Curriculum Development

PHYS 615: Completely redeveloped the course to focus on the dynamics of complex systems, highlighting the applicability of physics to other disciplines.
PHYS 165: Redesigned the course using Matlab as the working language.

III.C. Advising: Research or Clinical

This refers to students whose projects the faculty has supervised as adviser, committee chair, or committee member (indicate role). The name of student, academic year(s) involved, and the name of

institution if other than UMD should be indicated, as well as placement of the student(s), if the project is completed. List completed work first.

III.C.1. Undergraduate

Co-Advisor (Research) to the following undergraduate summer students: Andrew Melchionna (summer 2014), Jesus Caloca (summer 2014), Ari Zitin (summer 2013), Alex Gorowara (summer 2013), Katherine Sytwu (summer 2012), Diego Alcala (summer 2012) Ari Tenzer (summer 2011), Dustin Anderson (summer 2011), John Stout (summer 2010), Matthew Whiteway (summer 2010), Gilad Barlev (Summer 2008), Rose Fahig (summer 2007), John Platig (summer 2007), Emmanuel Cephas (summer 2007)

III.C.3. Doctoral

Currently advising the following graduate students: Keith Burghardt (physics, primary advisor), Sanya Pushkar (Applied Math and Scientific Computing, primary advisor), Zhixin Lu (chemical physics, co-advisor), Sarthak Chandra (physics, primary advisor)

Graduated Ph.D students: David Darmon, Spring 2015 (AMSC, primary advisor) Shane Squires, Spring 2014 (physics, primary advisor), Wai Lim Ku, Summer 2014, (physics, co-advisor), John Platig, Summer 2013 (physics, primary advisor), Karl Schmitt, Spring 2013 (Applied Math and Scientific Computing, primary advisor), Sanjeev Chauhan, Spring 2012 (physics, primary advisor), Kimberly Glass, Spring 2010 (physics, primary advisor), Andrew Pomerance, Fall 2009 (physics, co-advisor).

III.E. Advising: Other than Research Direction

III.E.1. Undergraduate

Undergraduate advising: Academic advisor to approximately 4 physics majors per year.

III.F. Professional and Extension Education

III.F.3. Workshops

“Nonlinear Dynamics of Networks,” Workshop, University of Maryland, April 2012

“Network Models of Social and Biological Contagion,” Workshop, Rutgers University, November 2009

“Is There a Physics of Society?” Workshop, Santa Fe Institute, January 2008

“The Structure and Organization of Robust Systems,” Workshop, Santa Fe Institute, January 2006

“The Robustness of Multiple Overlapping Networks,” Workshop, Santa Fe Institute, April 2005.

III.F.4. Other

Meetings Organized:

“UMD/NIST Symposium on Network Science,” University of Maryland, January 2014.

“Dynamics Days 2012,” International conference, Baltimore, Maryland, January 2012.

Outreach:

III.G. Other Teaching Activities

Lecturer on complex networks, Hands-on research in complex systems school, Sao Paulo, Brazil, August 2009.

IV. Service and Outreach

IV.A. Editorships, Editorial Boards, and Reviewing Activities

Include participation for journals and other learned publications (print and electronic).

IV.A.2. Editorial Boards

Editorial Board, Scientific Reports, July 2012 - Present

Advisory Board, Chaos, Jan 2011 - Present

IV.A.3. Reviewing Activities for Journals and Presses

Referee for Nature, Science, PRL, PRE, PNAS, Chaos, Journal of Theoretical Biology, Journal of Statistical Physics

IV.A.4. Reviewing Activities for Agencies and Foundations

NSF grant review panelist, 2011, 2012, 2013, 2015

IV.B. Committees, Professional & Campus Service

IV.B.1. Campus Service – Department

Physics Education Committee (2015-present)

Physics Priorities Committee (2015-present)

Physics Graduate Admissions Committee (2011, 2012, 2013, and 2014)

Physics Undergraduate Curriculum Implementation Committee (Spring 2012- 2014)

Physics Undergraduate Curriculum Reform Committee (Spring and Summer 2011)

Applied Dynamics Seminar Co-organizer (Fall 2010 – Spring 2014)

Statistical Physics Seminar Co-organizer (Fall 2007 – Present)

IV.B.2. Campus Service – College

IREAP Director Search Committee (Spring 2012 - Present)

AMSC Graduate Committee (Fall 2010 - Present)

IREAP Director Review Committee (Fall 2010)

IREAP Executive Committee (Fall 2007-Spring 2008)

IV.B.3. Campus Service – University

University Research Council Member, (2014-Present)

IV.B.6. Offices and Committee Memberships

American Physical Society Group on Statistical and Nonlinear Physics Executive Committee (2014-Present)

IV.F Community & Other Service

Lecturer on complex networks, Workshop for high school science teachers, George Mason University, June 2011

Lecturer on complex networks, Workshop for high school science teachers, Santa Fe Institute, June 2010.

V. Awards, Honors and Recognition

V.1. Research Fellowships, Prizes and Awards

Visiting Scholar, Institute for Advanced Study, Sept 2008 – June 2009

Finalist (1 of 10) for the Microsoft New Faculty Fellowship, 2007

Postdoctoral Fellowship, Santa Fe Institute, 2004-2006

NSF/SFI Graduate Physics Fellow (fellowship program for graduate students interested in interdisciplinary research), Santa Fe Institute, 2002

NSF IGERT (Integrative Graduate Research Traineeship) Fellow, Cornell University, 1999-2001