

# MARK NEWMAN

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Department of Physics and Center for the Study of Complex Systems

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## Education

1988 B.A., physics, University of Oxford  
1991 Ph.D., physics, Department of Theoretical Physics, University of Oxford

## Employment

1991-1994 Postdoctoral fellow, Department of Physics, Cornell University  
1994-1996 Research Associate, Cornell Theory Center, Cornell University  
1996-1998 Postdoctoral fellow, Santa Fe Institute  
1998-2002 Research Professor, Santa Fe Institute  
2002-2005 Assistant Professor, Department of Physics, University of Michigan  
2005-2007 Associate Professor, Department of Physics, University of Michigan  
2007-present Full Professor, Department of Physics, University of Michigan  
2008-2015 Paul Dirac Collegiate Professor of Physics, University of Michigan  
2015-present Anatol Rapoport Distinguished University Professor of Physics, University of Michigan

## Visiting positions

2000 Visiting Professor, Center for Applied Mathematics, Cornell University  
2002-present External Faculty member, Santa Fe Institute  
2006 Visiting Professor, McCormick School of Engineering, Northwestern University  
2008-2009 Visiting Professor, Santa Fe Institute  
2016 Visiting Professor, Rudolf Peierls Centre for Theoretical Physics, University of Oxford  
2016 Visiting Professor, Isaac Newton Institute for Mathematical Sciences, University of Cambridge

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## Recent funded research

2017-2020 National Science Foundation, \$294,514: Broad-scale modeling of complex networks  
2014-2017 National Science Foundation, \$265,000: Large-scale structure in complex networks  
2012-2016 Defense Advanced Research Projects Agency, \$2.9 million: Statistical inference for detecting structures and anomalies in networks  
2011-2014 National Science Foundation, \$320,000: Large-scale structure in complex networks  
2009-2011 James S. McDonnell Foundation, \$417,576: Statistical inference and machine learning for complex networks

2008–2011	National Science Foundation, \$150,000: The structure and dynamics of social networks and other networked systems
2004–2007	National Science Foundation, \$268,421: The structure and dynamics of social networks and other networked systems
2002–2008	James S. McDonnell Foundation, \$408,000: Networks and contagion among computers and people
2001–2004	National Science Foundation, \$144,236: The structure and dynamics of social networks and other networked systems

### **Awards and honors**

2018	Fellow of the Network Science Society
2016	John S. Guggenheim Fellowship
2016	Simons Fellow in Theoretical Physics
2014	Winner, 2014 Lagrange Prize
2014	Fellow of the American Association for the Advancement of Science
2014	Top 1% Highest Cited Physicists in the world, Thomson-Reuters Science Citation Index
2013	Senior Fellow, Michigan Society of Fellows
2012	Excellence in Education Award, University of Michigan
2011	Faculty Recognition Award, University of Michigan
2010	Ulam Distinguished Lecturer, Santa Fe Institute
2008	Gold Prize of the Geographic Association for <i>The Atlas of the Real World</i>
2007	Fellow of the American Physical Society
2004	Robert D. and Janet E. Neary Research Award, University of Michigan
2003	Harold C. Earley Faculty Research Award, University of Michigan
1992	NATO Fellow
1991	Lindemann Trust Fellow

### **Current and former students and postdocs**

Michelle Girvan, Ph.D. 2003 (now Full Professor, University of Maryland)  
 Petter Holme, Postdoc, 2005–2006 (Professor, Tokyo Institute of Technology, Japan)  
 Michael Gastner, Ph.D. 2005 (Assistant Professor, Yale-NUS College, Singapore)  
 Juyong Park, Ph.D. 2006 (Associate Professor, KAIST, South Korea)  
 Elizabeth Leicht, Ph.D. 2008 (Research division, Facebook Corporation)  
 Gourab Ghoshal, Ph.D. 2009 (Assistant Professor, University of Rochester)  
 Bethany Percha, M.P.H. 2010 (Assistant Professor, Mount Sinai School of Medicine, New York)  
 Brian Karrer, Ph.D. 2011 (Research division, Facebook Corporation)  
 Brian Ball, Ph.D. 2014 (Dotomi Inc.)  
 Travis Martin, Ph.D. 2016 (Google Inc.)  
 Xiao Zhang, Ph.D. 2017 (Owler Inc.)  
 Maria Riolo, Postdoc  
 George Cantwell, Ph.D. candidate  
 Alec Kirkley, Ph.D. pre-candidate  
 Jean-Gabriel Young, Postdoc

### **Service and administration**

2017–2018	Faculty search committee (chair), Michigan Complex Systems
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2017–2018 Distinguished University Professorship committee, University of Michigan  
 2016–2017 Graduate awards committee, Michigan Physics  
 2015–2016 Faculty search committee, Michigan Complex Systems  
 2014–2015 Faculty search committee, Michigan Complex Systems  
 2014–2015 Graduate admissions committee, Michigan Physics  
 2014 Faculty Recognition Awards committee, University of Michigan  
 2013–2014 Faculty search committee, Michigan Complex Systems  
 2013–2014 Colloquium organizer, Michigan Physics  
 2013 International Conference on Network Science (NetSci 2013), program committee  
 2013 Faculty Recognition Awards committee, University of Michigan  
 2013 European Physical Society Outstanding Referee  
 2013 Faculty Greivance Board, University of Michigan  
 2012 Faculty Recognition Awards committee, University of Michigan  
 2012–2013 Faculty search committee, Michigan Complex Systems  
 2012–2013 Faculty search committee, Michigan Physics  
 2012–2013 Third Century Initiative steering committee, University of Michigan  
 2011 Santa Fe Institute Complex Systems Summer School, co-organizer  
 2011–2014 Northwestern University NSF program on complex networks, advisory board  
 2010–2011 SIAM Mathematics Awareness Month, organizing committee  
 2010–2011 Long-range planning committee, Michigan Physics  
 2010–2011 IT committee, Michigan Physics  
 2010–present International Faculty Advisor, University of Michigan  
 2009–2014 Santa Fe Institute Science Board  
 2009–2010 Editorial committee, Michigan Physics  
 2008–present Guest editor, *Proceedings of the National Academy of Sciences*  
 2008–2009 Graduate qualifying exam committee, Michigan Physics  
 2008 American Physical Society Outstanding Referee  
 2008 NSF panel on Foundations for Complex Systems Research in the Physical Sciences  
 2007–2008 Departmental Executive Committee, Michigan Physics  
 2007–2008 Faculty search committee, Michigan Physics  
 2007–2008 Graduate qualifying exam committee, Michigan Physics  
 2007–present Oxford University Complexity Centre, international advisory board  
 2005–2006 Faculty search committee (chair), Michigan Physics  
 2005–2006 Faculty search committee (chair), Michigan Complex Systems  
 2005–2006 Graduate qualifying exam committee, Michigan Physics  
 2005–2006 Undergraduate concerns committee, Michigan Physics  
 2005–2006 Computing committee, Michigan Physics  
 2004–2005 Graduate qualifying exam committee, Michigan Physics  
 2003–2004 Graduate qualifying exam committee, Michigan Physics  
 2002–2003 Condensed matter seminar organizer, Michigan Physics  
 Regular tenure and promotion panels

**Refereeing:** American Physical Society Outstanding Referee 2008, European Physical Society Distinguished Referee 2013

Referee for *Nature*, *Nature Physics*, *Science*, *Proceedings of the National Academy*, *Physical Review Letters*, *Physical Review B*, *Physical Review E*, *Physical Review X*, *Proceedings of the Royal Society*, *Journal of the Royal Society Interface*, *Journal of Statistical Physics*, *Journal of Statistical Mechanics*, *Physica A*, *Physica D*, Euro-

*physics Letters, European Physical Journal B, Journal of Physics A, Physics Letters A, International Journal of Modern Physics C, American Journal of Physics, Journal of Complex Networks, Advances in Complex Systems, Complexity, PLOS Computational Biology, Scientific Reports, PLOS One, Journal of Theoretical Biology, Chaos, Physics Reports, Reviews of Modern Physics, Social Networks.*

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## Teaching

Course	Title	Institution	Year
Physics 406	Statistical and Thermal Physics	University of Michigan	2002
Physics 406	Statistical and Thermal Physics	University of Michigan	2003
Complex Systems 535	Network Science	University of Michigan	2004
Physics 406	Statistical and Thermal Physics	University of Michigan	2004
Complex Systems 535	Network Science	University of Michigan	2005
Complex Systems 511	Theory of Complex Systems	University of Michigan	2006
Physics 406	Statistical and Thermal Physics	University of Michigan	2007
Complex Systems 511	Theory of Complex Systems	University of Michigan	2007
Physics 390	Introduction to Modern Physics	University of Michigan	2008
Complex Systems 535	Network Science	University of Michigan	2009
Physics 390	Introduction to Modern Physics	University of Michigan	2010
Complex Systems 535	Network Science	University of Michigan	2010
Physics 411	Computational Physics	University of Michigan	2011
Complex Systems 535	Network Science	University of Michigan	2011
Physics 411	Computational Physics	University of Michigan	2012
Complex Systems 535	Network Science	University of Michigan	2012
Physics 411	Computational Physics	University of Michigan	2013
Complex Systems 535	Network Science	University of Michigan	2013
Physics 411	Computational Physics	University of Michigan	2014
Complex Systems 535	Network Science	University of Michigan	2014
Physics 390	Introduction to Modern Physics	University of Michigan	2015
Complex Systems 535	Network Science	University of Michigan	2015
Physics 411	Computational Physics	University of Michigan	2017
Complex Systems 535	Network Science	University of Michigan	2017
Physics 411	Computational Physics	University of Michigan	2018

Also: Santa Fe Institute Complex Systems Summer School, Santa Fe, New Mexico, Summer 1996, 1998, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2011, 2012, and 2015 as well as occasional other schools

## Thesis committees

Name	Department	Role	Graduation date
Jaeil Kim	Physics	Member	Winter 2002
Christopher Warren	Physics	Member	Summer 2003
Brett Pearson	Physics	Member	Winter 2004
Michael Gastner	Physics	Chair	Fall 2005

Han Peters	Mathematics	Cognate	Summer 2005
Sudin Bhattacharya	Mechanical Engineering	Member	Summer 2006
Juyong Park	Physics	Chair	Summer 2006
Dongxiao Zhu	Bioinformatics	Member	Summer 2006
Gunes Erkan	Computer Science	Cognate	Summer 2007
Daimian Wang	Physics	Member	Winter 2007
Elizabeth Leicht	Physics	Chair	Summer 2008
Althea Moorhead	Physics	Member	Summer 2008
Sarah Feldt	Physics	Member	Summer 2009
Gourab Ghoshal	Physics	Chair	Fall 2009
Kevin Haworth	Applied Physics	Member	Winter 2009
Jong-Hoon Kim	Epidemiology	Member	Fall 2009
Eva-Marie Proszkow	Physics	Member	Summer 2009
Christopher Henry	Epidemiology	Member	Winter 2010
Casey Schneider-Mizell	Physics	Member	Summer 2010
Jane Wang	Applied Physics	Member	Fall 2010
David Adams	Physics	Member	Winter 2011
Eytan Bakshy	School of Information	Cognate	Fall 2011
Shanna Shaked	Applied Physics	Member	Winter 2011
Justin Gillespie	Naval Architecture	Cognate	Winter 2012
Brian Karrer	Physics	Chair	Winter 2012
Kevin Xu	Electrical Engineering	Cognate	Summer 2012
Li Zhang	Physics	Member	Fall 2012
Yunpeng Zhao	Statistics	Cognate	Summer 2012
Navid Dianati	Physics	Member	Winter 2013
Yen Ting Lin	Physics	Member	Summer 2013
Brian Ball	Physics	Chair	Summer 2014
Morgan Parker	Naval Architecture	Cognate	Summer 2014
Maria Riolo	Applied Mathematics	Member	Fall 2014
Adam Sypniewski	Physics	Member	Winter 2014
Daniel Wilcox	Physics	Member	Winter 2015
Pablo Damasceno	Chemical Engineering	Cognate	Summer 2015
Jieshi Fang	Civil Engineering	Cognate	Summer 2015
Travis Martin	Computer Science	Co-chair	Summer 2016
Yuan Zhang	Statistics	Cognate	Summer 2016
Andrew Elliot	Mathematics (Oxford)	External examiner	Winter 2017
Xiao Zhang	Physics	Chair	Summer 2017
Christopher Henry	Epidemiology	Cognate	Summer 2017

## Press coverage

Washington Post, November 1, 2016

BBC News online, October 21, 2013

Science News, November 7, 2012

Times Higher Education, June 2, 2011

National Public Radio's "Weekend Edition," November 16, 2008

The Times, February 26, 2007

Daily Telegraph, February 1, 2007

Chicago Tribune, September 24, 2006  
Washington Post, November 13, 2004 and August 24, 2006  
Los Angeles Times, November 21, 2004  
CNN Television News, November 12, 2004  
Discovery Channel, May 26, 2006  
New Scientist magazine, August 12, 2004 and May 6, 2006  
Guardian, November 16, 2004

Many others, including Science, Nature, The Lancet, The Atlantic Monthly, Vanity Fair magazine, Esquire magazine, Der Spiegel magazine, ABC News online, Salon.com, and Die Zeit.

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## Publications

Citation record (Science Citation Index, June 18, 2018): Total citations: 61 820, average citations per paper: 398, h-index: 67

## Books

1. Mark Newman, *Computational Physics*, Createspace Independent Publishing (2012).
2. M. E. J. Newman, *Networks: An Introduction*. Oxford University Press, Oxford (2010).
3. Daniel Dorling, Mark Newman, and Anna Barford, *The Atlas of the Real World*, Thames & Hudson, London (2008).
4. M. E. J. Newman, A.-L. Barabási, and D. J. Watts, *The Structure and Dynamics of Networks*. Princeton University Press, Princeton (2006).
5. M. E. J. Newman and G. T. Barkema, *Monte Carlo Methods in Statistical Physics*. Oxford University Press, Oxford (1999).
6. J. J. Binney, N. J. Dowrick, A. J. Fisher, and M. E. J. Newman, *The Theory of Critical Phenomena*. Oxford University Press, Oxford (1992).

## Papers in refereed journals

1. E. E. Bruch and M. E. J. Newman, Aspirational pursuit of mates in online dating markets. *Science Advances*, in press.
2. M. E. J. Newman, Network structure from rich but noisy data. *Nature Physics* **14**, 542–545 (2018).
3. X. Zhang, C. Moore, and M. E. J. Newman, Random graph models for dynamic networks. *Eur. Phys. J. B* **90**, 200 (2017).
4. M. A. Riolo, G. T. Cantwell, G. Reinert, and M. E. J. Newman, Efficient method for estimating the number of communities in a network. *Phys. Rev. E* **96**, 032310 (2017).
5. M. E. J. Newman, Equivalence between modularity optimization and maximum likelihood methods for community detection. *Phys. Rev. E* **94**, 052315 (2016).
6. M. E. J. Newman and G. Reinert, Estimating the number of communities in a network. *Phys. Rev. Lett.* **117**, 078301 (2016).

7. M. E. J. Newman and A. Clauset, Structure and inference in annotated networks. *Nature Communications* **7**, 11863 (2016).
8. T. Martin, B. Ball, and M. E. J. Newman, Structural inference for uncertain networks. *Phys. Rev. E* **93**, 012306 (2016).
9. P. Zhang, C. Moore, and M. E. J. Newman, Community detection in networks with unequal groups. *Phys. Rev. E* **93**, 012303 (2016).
10. X. Zhang and M. E. J. Newman, Multiway spectral community detection in networks. *Phys. Rev. E* **92**, 052808 (2015).
11. M. E. J. Newman and T. P. Peixoto, Generalized communities in networks. *Phys. Rev. Lett.* **115**, 088701 (2015).
12. X. Zhang, T. Martin, and M. E. J. Newman, Identification of core-periphery structure in networks. *Phys. Rev. E* **91**, 032803 (2015).
13. M. E. J. Newman and T. Martin, Equitable random graphs. *Phys. Rev. E* **90**, 052824 (2014).
14. B. Karrer, M. E. J. Newman, and L. Zdeborová, Percolation on sparse networks. *Phys. Rev. Lett.* **113**, 208702 (2014).
15. T. Martin, X. Zhang, and M. E. J. Newman, Localization and centrality in networks. *Phys. Rev. E* **90**, 052808 (2014).
16. X. Zhang, R. R. Nadakuditi, and M. E. J. Newman, Spectra of random graphs with community structure and arbitrary degrees. *Phys. Rev. E* **89**, 042816 (2014).
17. M. A. Riolo and M. E. J. Newman, First-principles multiway spectral partitioning of graphs. *Journal of Complex Networks* **2**, 121–140 (2014).
18. M. E. J. Newman, Prediction of highly cited papers. *Europhys. Lett.* **105**, 28002 (2014).
19. M. E. J. Newman, Spectral methods for network community detection and graph partitioning. *Phys. Rev. E* **88**, 042822 (2013).
20. M. E. J. Newman and C. R. Ferrario, Interacting epidemics and coinfection on contact networks. *PLOS One* **8**, e71321 (2013).
21. M. E. J. Newman, Community detection and graph partitioning. *Europhys. Lett.* **103**, 28003 (2013).
22. T. Martin, B. Ball, B. Karrer, and M. E. J. Newman, Coauthorship and citation patterns in the Physical Review. *Phys. Rev. E* **88**, 012814 (2013).
23. B. Ball and M. E. J. Newman, Friendship networks and social status. *Network Science* **1**, 16–30 (2013).
24. R. R. Nadakuditi and M. E. J. Newman, Spectra of random graphs with arbitrary expected degrees. *Phys. Rev. E* **87**, 012803 (2013).
25. R. R. Nadakuditi and M. E. J. Newman, Graph spectra and the detectability of community structure in networks. *Phys. Rev. Lett.* **108**, 188701 (2012).
26. M. E. J. Newman, Communities, modules and large-scale structure in networks. *Nature Physics* **8**, 25–31 (2012).
27. B. Ball, B. Karrer, and M. E. J. Newman, An efficient and principled method for detecting communities in networks. *Phys. Rev. E* **84**, 036103 (2011).
28. B. Karrer and M. E. J. Newman, Competing epidemics on complex networks. *Phys. Rev. E* **84**, 036106 (2011).
29. B. Percha, M. E. J. Newman, and B. Foxman, Transmission probabilities and durations of immunity for three pathogenic group B Streptococcus serotypes. *Infection, Genetics, and Evolution* **11**, 1407–1412 (2011).

30. M. E. J. Newman, Complex systems. *Am. J. Phys.* **79**, 800–810 (2011).
31. B. Karrer and M. E. J. Newman, Stochastic blockmodels and community structure in networks. *Phys. Rev. E* **83**, 016107 (2011).
32. B. Karrer and M. E. J. Newman, Random graphs containing arbitrary distributions of subgraphs. *Phys. Rev. E* **82**, 066118 (2010).
33. R. Guimerà, D. B. Stouffer, M. Sales-Pardo, E. A. Leicht, M. E. J. Newman, and L. A. N. Amaral, Origin of compartmentalization in food webs. *Ecology* **91**, 2941–2951 (2010).
34. B. Karrer and M. E. J. Newman, A message passing approach for general epidemic models. *Phys. Rev. E* **82**, 016101 (2010).
35. A. Clauset, C. R. Shalizi, and M. E. J. Newman, Power-law distributions in empirical data. *SIAM Review* **51**, 661–703 (2009).
36. M. E. J. Newman, Random graphs with clustering. *Phys. Rev. Lett.* **103**, 058701 (2009).
37. B. Karrer and M. E. J. Newman, Random graph models for directed acyclic networks. *Phys. Rev. E* **80**, 046110 (2009).
38. G. Ghoshal, V. Zlatic, G. Caldarelli, and M. E. J. Newman, Random hypergraphs and their applications. *Phys. Rev. E* **79**, 066118 (2009).
39. M. E. J. Newman, The first-mover advantage in scientific publication. *Europhys. Lett.* **86**, 68001 (2009).
40. B. Karrer and M. E. J. Newman, Random acyclic networks. *Phys. Rev. Lett.* **102**, 128701 (2009).
41. A. Clauset, C. Moore, and M. E. J. Newman, Hierarchical structure and the prediction of missing links in networks. *Nature* **453**, 98–101 (2008).
42. M. Newman, The physics of networks. *Physics Today*, November 2008, pp. 33–38.
43. B. Karrer, E. Levina, and M. E. J. Newman, Robustness of community structure in networks. *Phys. Rev. E* **77**, 046119 (2008).
44. M. E. J. Newman and G. Ghoshal, Bicomponents and the robustness of networks to failure. *Phys. Rev. Lett.* **100**, 138701 (2008).
45. E. A. Leicht and M. E. J. Newman, Community structure in directed networks. *Phys. Rev. Lett.* **100**, 118703 (2008).
46. M. E. J. Newman, Component sizes in networks with arbitrary degree distributions. *Phys. Rev. E* **76**, 045101 (2007).
47. M. A. Porter, P. J. Mucha, M. E. J. Newman, and A. J. Friend, Community structure in the United States House of Representatives. *Physica A* **386**, 414–438 (2007).
48. E. A. Leicht, G. Clarkson, K. Shedden, and M. E. J. Newman, Large-scale structure of time evolving citation networks. *Eur. Phys. J. B* **59**, 75–83 (2007).
49. G. Ghoshal and M. E. J. Newman, Growing distributed networks with arbitrary degree distributions. *Eur. Phys. J. B* **58**, 175–184 (2007).
50. M. E. J. Newman and E. A. Leicht, Mixture models and exploratory analysis in networks. *Proc. Natl. Acad. Sci. USA* **104**, 9564–9569 (2007).
51. P. Holme and M. E. J. Newman, Nonequilibrium phase transition in the coevolution of networks and opinions. *Phys. Rev. E* **74**, 056108 (2006).
52. C. Moore, G. Ghoshal, and M. E. J. Newman, Exact solutions for models of evolving networks with addition and deletion of nodes. *Phys. Rev. E* **74**, 036121 (2006).



53. M. E. J. Newman, Finding community structure in networks using the eigenvectors of matrices. *Phys. Rev. E* **74**, 036104 (2006).
54. M. T. Gastner and M. E. J. Newman, Optimal design of spatial distribution networks. *Phys. Rev. E* **74**, 016117 (2006).
55. M. E. J. Newman, Modularity and community structure in networks. *Proc. Natl. Acad. Sci. USA* **103**, 8577–8582 (2006).
56. L. Ancel Meyers, M. E. J. Newman, and B. Pourbohloul, Predicting epidemics on directed contact networks. *J. Theor. Bio.* **240**, 400–418 (2006).
57. M. T. Gastner and M. E. J. Newman, The spatial structure of networks. *Eur. Phys. J. B* **49**, 247–252 (2006).
58. B. Foxman, M. Newman, B. Percha, K. K. Holmes, and S. O. Aral, Measures of sexual partnerships: Lengths, gaps, overlaps and sexually transmitted infection. *Sexually Transmitted Diseases* **33**, 209–214 (2006).
59. E. A. Leicht, P. Holme, and M. E. J. Newman, Vertex similarity in networks. *Phys. Rev. E* **73**, 026120 (2006).
60. M. T. Gastner and M. E. J. Newman, Shape and efficiency in spatial distribution networks. *J. Stat. Mech.* **2006**, P01015 (2006).
61. D. Dorling, A. Barford, and M. Newman, Worldmapper: The world as you’ve never seen it before. *IEEE Transactions on Visualization and Computer Graphics* **12**, 757–764 (2006).
62. M. E. J. Newman, Threshold effects for two pathogens spreading on a network. *Phys. Rev. Lett.* **95**, 108701 (2005).
63. J. Park and M. E. J. Newman, A network-based ranking system for American college football. *J. Stat. Mech.* **2005**, P10014 (2005).
64. J. Park and M. E. J. Newman, Solution for the properties of a clustered network. *Phys. Rev. E* **72**, 026136 (2005).
65. M. E. J. Newman, Power laws, Pareto distributions and Zipf’s law. *Contemporary Physics* **46**, 323–351 (2005).
66. M. A. Porter, P. J. Mucha, M. E. J. Newman, and C. M. Warmbrand, A network analysis of committees in the United States House of Representatives. *Proc. Natl. Acad. Sci. USA* **102**, 7057–7062 (2005).
67. M. E. J. Newman, A measure of betweenness centrality based on random walks. *Social Networks* **27**, 39–54 (2005).
68. M. T. Gastner, C. R. Shalizi, and M. E. J. Newman, Maps and cartograms of the 2004 US presidential election results. *Advances in Complex Systems* **8**, 117–123 (2005).
69. L. Ancel Meyers, B. Pourbohloul, M. E. J. Newman, D. M. Skowronski, and R. C. Brunham, Network theory and SARS: Predicting outbreak diversity. *J. Theor. Bio.* **232**, 71–81 (2005).
70. J. Park and M. E. J. Newman, Solution of the 2-star model of a network. *Phys. Rev. E* **70**, 066146 (2004).
71. J. Park and M. E. J. Newman, The statistical mechanics of networks. *Phys. Rev. E* **70**, 066117 (2004).
72. A. Clauset, M. E. J. Newman, and C. Moore, Finding community structure in very large networks. *Phys. Rev. E* **70**, 066111 (2004).
73. M. E. J. Newman, Analysis of weighted networks. *Phys. Rev. E* **70**, 056131 (2004).
74. R. Milo, N. Kashtan, S. Itzkovitz, M. E. J. Newman, and U. Alon, Subgraphs in networks. *Phys. Rev. E* **70**, 058102 (2004).

75. M. Lachmann, M. E. J. Newman, and C. Moore, The physical limits of communication. *Am. J. Phys.* **72**, 1290–1293 (2004).
76. D. Lusseau and M. E. J. Newman, Identifying the role that individual animals play in their social network. *Proc. R. Soc. London B* **271**, S477–S481 (2004).
77. M. E. J. Newman, Fast algorithm for detecting community structure in networks. *Phys. Rev. E* **69**, 066133 (2004).
78. M. T. Gastner and M. E. J. Newman, Diffusion-based method for producing density equalizing maps. *Proc. Natl. Acad. Sci. USA* **101**, 7499–7504 (2004).
79. J. Balthrop, S. Forrest, M. E. J. Newman, and M. M. Williamson, Technological networks and the spread of computer viruses. *Science* **304**, 527–529 (2004).
80. M. E. J. Newman, Detecting community structure in networks. *Eur. Phys. J. B* **38**, 321–330 (2004).
81. M. E. J. Newman, Coauthorship networks and patterns of scientific collaboration. *Proc. Natl. Acad. Sci. USA* **101**, 5200–5205 (2004).
82. M. E. J. Newman and M. Girvan, Finding and evaluating community structure in networks. *Phys. Rev. E* **69**, 026113 (2004).
83. M. E. J. Newman and J. Park, Why social networks are different from other types of networks. *Phys. Rev. E* **68**, 036122 (2003).
84. M. E. J. Newman, The structure and function of complex networks. *SIAM Review* **45**, 167–256 (2003).
85. M. E. J. Newman, Properties of highly clustered networks. *Phys. Rev. E* **68**, 026121 (2003).
86. J. Park and M. E. J. Newman, The origin of degree correlations in the Internet and other networks. *Phys. Rev. E* **68**, 026112 (2003).
87. M. E. J. Newman, Mixing patterns in networks. *Phys. Rev. E* **67**, 026126 (2003).
88. L. Ancel Meyers, M. E. J. Newman, M. Martin, and S. Schrag, Applying network theory to epidemics: Control measures for outbreaks of *Mycoplasma pneumoniae*. *Emerging Infectious Diseases* **9**, 204–210 (2003).
89. M. E. J. Newman, Ego-centered networks and the ripple effect. *Social Networks* **25**, 83–95 (2003).
90. M. E. J. Newman, Assortative mixing in networks. *Phys. Rev. Lett.* **89**, 208701 (2002).
91. M. E. J. Newman, S. Forrest, and J. Balthrop, Email networks and the spread of computer viruses. *Phys. Rev. E* **66**, 035101 (2002).
92. R. M. Ziff and M. E. J. Newman, Convergence of threshold estimates for two-dimensional percolation. *Phys. Rev. E* **66**, 016129 (2002).
93. M. E. J. Newman, The structure and function of networks. *Computer Physics Communications* **147**, 40–45 (2002).
94. M. E. J. Newman, Spread of epidemic disease on networks. *Phys. Rev. E* **66**, 016128 (2002).
95. M. E. J. Newman, M. Girvan, and J. D. Farmer, Optimal design, robustness, and risk aversion. *Phys. Rev. Lett.* **89**, 028301 (2002).
96. M. Girvan and M. E. J. Newman, Community structure in social and biological networks. *Proc. Natl. Acad. Sci. USA* **99**, 7821–7826 (2002).
97. D. J. Watts, P. S. Dodds, and M. E. J. Newman, Identity and search in social networks. *Science* **296**, 1302–1305 (2002).
98. 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).

99. M. E. J. Newman, D. J. Watts, and S. H. Strogatz, Random graph models of social networks. *Proc. Natl. Acad. Sci. USA* **99**, 2566–2572 (2002).
100. M. E. J. Newman, I. Jensen, and R. M. Ziff, Percolation and epidemics in a two-dimensional small world. *Phys. Rev. E* **65**, 021904 (2002).
101. D. Stauffer and M. E. J. Newman, Dynamics of a simple evolutionary process. *Int. J. Mod. Phys. C* **12**, 1375–1382 (2001).
102. E. M. Jin, M. Girvan, and M. E. J. Newman, The structure of growing social networks. *Phys. Rev. E* **64**, 046132 (2001).
103. D. S. Callaway, J. E. Hopcroft, J. M. Kleinberg, M. E. J. Newman, and S. H. Strogatz, Are randomly grown graphs really random? *Phys. Rev. E* **64**, 041902 (2001).
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106. M. E. J. Newman and R. M. Ziff, Fast Monte Carlo algorithm for site or bond percolation. *Phys. Rev. E* **64**, 016706 (2001).
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121. M. E. J. Newman, C. Moore, and D. J. Watts, Mean-field solution of the small-world network model. *Phys. Rev. Lett.* **84**, 3201–3204 (2000).
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125. C. Moore and M. E. J. Newman, Glassy dynamics and aging in an exactly solvable spin model. *Phys. Rev. E* **60**, 5068–5072 (1999).
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141. M. E. J. Newman and B. W. Roberts, Mass extinction: Evolution and the effects of external influences on unfit species. *Proc. R. Soc. London B* **260**, 31–37 (1995).
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146. M. E. J. Newman and C. L. Henley, Transfer-matrix analysis of the canonical-cell model of a quasicrystal. *J. Noncryst. Solids* **153**, 205–209 (1993).
147. M. E. J. Newman, Green's functions, density of states and dynamic structure factor for a general one-dimensional quasicrystal. *Phys. Rev. B* **43**, 10915–10927 (1991).
148. M. E. J. Newman and R. B. Stinchcombe, Hopping conductivity of the fibonacci-chain quasicrystal. *Phys. Rev. B* **43**, 1183–1186 (1991).

### **Book chapters**

1. M. E. J. Newman, Mathematics of networks. In L. Blume and S. Durlauf (eds.), *The New Palgrave Encyclopedia of Economics*, Palgrave Macmillan, Basingstoke, 2nd edition (2008).
2. A. Clauset, C. Moore, and M. E. J. Newman, Structural inference of hierarchies in networks. In E. Airolidi, D. M. Blei, S. E. Fienberg, A. Goldenberg, E. P. Xing, and A. X. Zheng (eds.), *Statistical Network Analysis: Models, Issues, and New Directions*, number 4503 in Lecture Notes in Computer Science, pp. 1–13, Springer, Berlin (2007).
3. M. E. J. Newman, Who is the best connected scientist? A study of scientific coauthorship networks. In E. Ben-Naim, H. Frauenfelder, and Z. Toroczkai (eds.), *Complex Networks*, number 650 in Lecture Notes in Physics, pp. 337–370, Springer, Berlin (2004).
4. M. E. J. Newman, Random graphs as models of networks. In S. Bornholdt and H. G. Schuster (eds.), *Handbook of Graphs and Networks*, pp. 35–68, Wiley-VCH, Berlin (2003).
5. M. Mitchell and M. E. J. Newman, Complex systems theory and evolution. In M. Pagel (ed.), *Encyclopedia of Evolution*, Oxford University Press, New York (2002).
6. R. V. Solé and M. E. J. Newman, Patterns of extinction and biodiversity in the fossil record. In T. Munn (ed.), *Encyclopedia of Global Environmental Change*, John Wiley, New York (2001).
7. M. E. J. Newman and G. J. Eble, Patterns of biodiversity in the fossil record. In S. Levin (ed.), *Encyclopedia of Biodiversity*, Academic Press, London (2000).
8. G. T. Barkema and M. E. J. Newman, New Monte Carlo algorithms for classical spin systems. In D. Ferguson, J. I. Siepmann, and D. G. Truhlar (eds.), *Monte Carlo Methods in Chemical Physics*, John Wiley, New York (1999).

### **Presentations**

#### **Invited conference presentations:**

1. SIAM Workshop on Network Science (NS17), Pittsburgh, Pennsylvania, July 13 and 14, 2017, keynote speaker
2. 3rd Annual Conference on Financial Stability, Center on Finance, Law, and Policy, Ann Arbor, Michigan, November 16 and 17, 2017, invited panelist
3. APS Ohio Section Annual Meeting, Eastern Michigan University, May 5-6, 2017, invited speaker

4. Symposium on Spatial Networks, University of Oxford, September 7-8, 2016, invited speaker
5. Workshop on Statistical Network Analysis, Isaac Newton Institute, Cambridge University, July 11-15, 2016, invited speaker
6. Workshop on Cultural Patterns: Multiscale Data-driven Models, Institute for Pure and Applied Mathematics, UCLA, Los Angeles, California, May 9-13, 2016, invited speaker
7. Inference on Networks, Santa Fe Institute workshop, Santa Fe, New Mexico, December 14–18, 2015, invited speaker
8. Complex Systems Summer School, Santa Fe, New Mexico, June 2015, principal lecturer
9. International Conference on Social Computing, Behavioral Modeling, and Prediction, Washington, DC, March 31–April 3, 2015, keynote speaker
10. 6th Workshop on Complex Networks (CompleNet 2015), New York City, March 25–27, 2015, keynote speaker
11. Conference on Complexity Science, Brighton, UK, August 19–22, 2014, keynote speaker
12. Conference on Computational Physics (CCP 2014), Boston, Mass., August 11–14, 2014, invited speaker
13. International Conference on Network Science (NetSci 2014), Berkeley, California, June 2–6, 2014, invited speaker
14. Cambridge Networks Day, Cambridge University, UK, May 23, 2014, keynote speaker
15. 111th Rutgers Statistical Mechanics Meeting, New Brunswick, New Jersey, May 11-13, 2014, invited speaker
16. Santa Fe Institute Annual Science Symposium, Santa Fe, New Mexico, May 2, 2014, invited speaker
17. Statistical Mechanics Foundations of Complexity, Santa Fe Institute, May 8–10, 2014, invited speaker
18. American Physical Society March Meeting, Denver, Colorado, March 3–7, 2014, invited speaker
19. Neural Information Processing Systems (NIPS 2013), Lake Tahoe, Nevada, December 5–10, 2013, invited speaker
20. DIMACS Workshop on Statistical Analysis of Network Dynamics and Interactions, Rutgers University, New Jersey, November 7–8, 2013, keynote speaker
21. Deep Computation in Statistical Physics, Santa Fe, New Mexico, August 1–3, 2013, invited speaker
22. Structure, Statistical Inference, and Dynamics in Networks, Santa Fe, New Mexico, May 6–9, 2013, invited speaker
23. Dynamics Days, Denver Colorado, January 3–6, 2013, invited speaker
24. Lawrence Livermore Workshop on Current Challenges in Computing, Napa, CA, August 27–29, 2012, invited speaker
25. Complex Systems Summer School, Santa Fe, New Mexico, June 2012, principal lecturer
26. 12th Experimental Chaos and Complexity Conference, Ann Arbor, Michigan, May 16–19, 2012, invited speaker
27. International Conference on Complex Systems, Boston, Massachusetts, June 26 to July 1, 2011, plenary speaker
28. 4th Annual Political Networks Conference, Ann Arbor, Michigan, June 14–18, 2011, plenary speaker
29. Complex Systems Summer School, Santa Fe, New Mexico, June 2011, co-organizer and lecturer

30. Conference on Computation as a Lens on the Sciences, Berkeley, California, May 7 and 8, 2011, invited speaker
31. Conference on Complex Systems, Northwestern University, Evanston, Illinois, March 6 and 7, 2011, keynote speaker
32. Conference on Statistics of Networks, SAMSI, North Carolina, August 29–September 1, 2010, invited speaker
33. Workshop on Statistics of Networks, Isaac Newton Institute, Cambridge, England, June 24–25, 2010, invited speaker
34. Workshop on Information, Networks, and Markets, Cambridge, England, June 22, 2010, invited speaker
35. International Conference on Network Science, Cambridge, Massachusetts, May 11–14, 2010, keynote speaker
36. American Physical Society March Meeting, Portland, Oregon, March 15–19, 2010, invited speaker
37. 2010 Berkeley Statistical Mechanics Meeting, University of California, Berkeley January 8–10, 2010, invited speaker
38. 2009 INFORMS Marketing Science Conference, University of Michigan, June 4–6, 2009, invited speaker
39. Society of Industrial and Applied Mathematics Front Range Conference, Denver, Colorado, March 14, 2009, keynote speaker
40. 100th Rutgers Statistical Mechanics meeting, New Brunswick, New Jersey, December 13–18, 2008, invited speaker
41. Workshop on Statistical Inference for Complex Networks, Santa Fe, New Mexico, December 3–5, 2008, invited speaker
42. Workshop on Advances in Theory of Networks and Strategic Interaction, Northwestern University, Evanston, October 3–4, 2008, invited speaker
43. Annual Meeting of the Association for the Advancement of Artificial Intelligence (AAAI 2008), Chicago, July 14–18, 2008, invited speaker
44. Annual Meeting of the Society for Industrial and Applied Mathematics (SIAM), San Diego, California, July 7–11, 2008, plenary speaker
45. International Conference on Network Science (NetSci 2008), Norwich, England, June 23–27, 2008, plenary speaker
46. Complex Systems Summer School, Santa Fe, New Mexico, June 2008, principal lecturer
47. European Conference on Complex Systems, Dresden, Germany, October 1–5, 2007, keynote speaker
48. 23rd International Conference on Statistical Physics (STATPHYS 23), Genoa, Italy, July 9–13, 2007, invited speaker
49. Conference on Complex Networks: From biology to information technology, Sardinia, Italy, July 2–6, 2007, invited speaker
50. Complex Systems Summer School, Santa Fe, New Mexico, June 2007, principal lecturer
51. International Conference on Network Science, New York City, May 21–24, 2007, invited speaker
52. Workshop on Random and Dynamic Graphs and Networks, Institute for Pure and Applied Mathematics, UCLA, Los Angeles, California, May 7–11, 2007, invited speaker

53. John Wiley Jones Distinguished Lecture in Science, Rochester Institute of Technology, May 30, 2007
54. British Applied Mathematics Colloquium, Bristol, England, April 17–19, 2007, plenary speaker
55. Workshop on Complex Networks and their Applications, Georgia Institute of Technology, Atlanta, Georgia, January 22–24, 2007, plenary speaker
56. École d'Été de Physique Théorique, Les Houches, France, July 3–7, 2006, invited lecturer
57. Summer School on Complex Networks, Bristol, England, July 10–14, 2006, invited lecturer
58. Conference on Optimization in Complex Networks, Los Alamos National Laboratory, New Mexico, June 19–22, 2006, invited speaker
59. Complex Systems Summer School, Santa Fe, New Mexico, June 2006, principal lecturer
60. International Conference on Network Science, Spencer, Indiana, May 22–25, 2006, invited speaker
61. March Meeting of the American Physical Society, Baltimore, March 13–17, 2006, invited speaker
62. Workshop on Statistics on Networks, National Academy of Sciences, Washington, DC, September 26–27, 2005, invited speaker
63. Workshop on Mathematical Epidemiology, Banff International Research Station, Banff, Canada, August 21–24, 2005, invited speaker
64. Santa Fe Institute Public Lecture, Santa Fe, New Mexico, June 15, 2005
65. Complex Systems Summer School, Santa Fe, New Mexico, June 2005, principal lecturer
66. Conference on Models of Real-World Random Networks, University of California, Berkeley, April 18–22, 2005, invited speaker
67. Conference on Network Science: Implications for Biology and Medicine, University of British Columbia, Vancouver, Canada, January 19–22, 2005, keynote speaker
68. Conference on Complex Systems, Northwestern University, Evanston, Illinois, October 29 and 30, 2004, invited speaker
69. Intel Corporation, Forum and Workshop on Modeling Complexity, October 5–6, 2004, keynote speaker
70. 13th Annual Conference on Computational Analysis of Social and Organizational Systems, Pittsburgh, Pennsylvania, June 27–29, 2004, keynote speaker
71. Complex Systems Summer School, Santa Fe, New Mexico, June 2004, invited lecturer
72. Rutgers Statistical Mechanics Meeting, Piscataway, New Jersey, May 16–18, 2004, invited speaker
73. March Meeting of the American Physical Society, Montreal, March 22–26, 2004, invited speaker
74. Annual Meeting of the American Association for the Advancement of Science, Seattle, February 12–16, 2004, invited speaker
75. Workshop on Networks and the Population Dynamics of Disease Transmission, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, November 17–21, 2003, invited speaker
76. Conference on Discrete Models for Complex Systems, Lyon, France, June 16–19, 2003, invited speaker
77. SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 27–31, 2003, invited speaker
78. CNLS Conference on Networks: Structure, Dynamics and Function, Santa Fe, May 11–16, 2003, invited speaker



79. National Academy Arthur M. Sackler Colloquium, Irvine, May 9–11, 2003, invited speaker
80. DIMACS meeting on Spatio-Temporal and Network Modeling of Diseases, Rutgers University, April 22–26, 2003, invited speaker
81. Annual Meeting of the American Mathematical Society, Baltimore, January 13–17, 2003, invited speaker
82. Fifteenth International Symposium on Mathematical Theory of Networks and Systems, University of Notre Dame, South Bend, August 12–16, 2002, invited speaker
83. NEC Lectures on Biophysics, Princeton, June 16–20, 2002, invited lecturer
84. Sitges Conference on Statistical Mechanics, Barcelona, Spain, June 10–14, 2002, invited speaker
85. March Meeting of the American Physical Society, Indianapolis, March 18–22, 2002, invited speaker
86. Berkeley Statistical Mechanics Meeting, UC Berkeley, January 11–13, 2002, invited speaker
87. Conference on Computational Physics, Aachen, Germany, September 5–8, 2001, plenary speaker
88. European Physical Society International Conference on Dynamical Networks in Complex Systems, Kiel, Germany, July 25–27, 2001, invited speaker
89. Summer School on Complex Systems, Central European University, Budapest, Hungary, July 16–20, 2001, principal lecturer
90. Gordon Conference on Nonlinear Science, Mount Holyoke, Massachusetts, June 17–22, 2001, invited speaker
91. SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 20–24, 2001, invited speaker
92. DARPA Principal Investigators Meeting, Santa Fe, April 17 and 18, 2001, keynote speaker
93. National Academy Arthur M. Sackler Colloquium, Irvine, March 23 and 24, 2001, invited speaker

### **Seminars and colloquia:**

1. University of Oxford, Department of Statistics, Distinguished Speaker Seminar, May 18, 2018
2. University of Oxford, Institute of New Economic Thinking, seminar, May 17, 2018
3. University of Chicago, Statistics colloquium, February 13, 2017
4. Gentry Lectures, Wake Forest University, Winston-Salem, NC, November 30–December 1, 2016, invited lecturer
5. Indiana University, Network Science Lecture, October 24, 2016
6. Case Western Reserve University, Physics colloquium, October 13, 2016
7. Cambridge University, Mathematical Sciences seminar, September 15, 2016
8. Turing Lecture, Alan Turing Institute, London, March 2, 2016
9. Royal Statistical Society, London, February 10, 2016, invited speaker
10. Oxford University, Distinguished Seminar in Statistics, March 11, 2016
11. Oxford University, Physics Colloquium, February 12, 2016
12. Oxford University, Physics Department public lecture, February 6, 2016
13. Oxford University, Mathematics Colloquium, January 29, 2016

14. Sandia Distinguished Lecture, Sandia National Laboratory, Albuquerque, New Mexico, June 25, 2015
15. Washington University, St. Louis, Physics colloquium, October 16, 2014
16. Harvard University, School of Engineering and Applied Sciences colloquium, October 6, 2014
17. University of Pittsburgh, Mathematics colloquium, September 26, 2014
18. University of Pittsburgh, Department of Mathematics, Theme Semester on Discrete Networks, invited lecturer, September 24-26, 2014
19. Ohio State University, Physics colloquium, August 26, 2014
20. UCLA, IPAM seminar, June 6, 2014
21. UCLA, Physics colloquium, June 5, 2014
22. Northwestern University, Institute on Complex System seminar, March 12, 2014
23. Stanford University, Physics colloquium, February 11, 2014
24. Harvard University, Badger Lecture in Network Medicine, November 19, 2013
25. Massachusetts Institute of Technology, Information and Decision Systems seminar, November 19, 2013
26. Center for Complex Network Research, Northeastern University, seminar, May 1, 2013
27. Boston University, Physics colloquium, April 30, 2013
28. Distinguished Lecture on Scientific Computing, Simon Fraser University, March 15, 2013
29. Center for Studies in Physics and Biology, Rockefeller University, seminar, October 8, 2012
30. Stony Brook University, Physics colloquium, March 20, 2012
31. Hitachi Distinguished Lecture, University of Oklahoma, November 11, 2011
32. Oxford University, Theoretical physics colloquium, October 14, 2011
33. Ockham Lecture, Oxford University, October 16, 2011
34. University of Chicago, Computation Institute seminar, April 4, 2011
35. Case Western Reserve University, Biomathematics seminar, March 25, 2011
36. Florida State University, Mathematics colloquium, January 28, 2011
37. Florida State University, Physics colloquium, January 27, 2011
38. Indiana University, Cognitive Science colloquium, November 8, 2010
39. University of Massachusetts, Amherst, Physics colloquium, October 6, 2010
40. Center for Computational Molecular Biology, University of Michigan, colloquium, September 29, 2010
41. Ulam Lectures, Santa Fe Institute (series of three lectures), September 14–16, 2010
42. University of Colorado, Boulder, Mathematics colloquium, March 13, 2009
43. Distinguished Lecture on Network Science, Pennsylvania State University, State College, Pennsylvania, January 14, 2009
44. 2008 NICO Distinguished Lecture, Northwestern University, Evanston, October 13, 2008
45. NSF ADVANCE Distinguished Lecture, Kansas State University, Manhattan, Kansas, September 4, 2008

46. Toyota Technological Institute at Chicago, seminar, November 9, 2007
47. Harvard University Medical School, seminar, November 16, 2006
48. University of Notre Dame, Condensed Matter seminar, October 27, 2006
49. Harvard University, Radcliffe Seminar, October 20, 2006
50. Northwestern University, Engineering Science and Applied Mathematics colloquium, October 16, 2006
51. Emory University, Physics colloquium, September 22, 2006
52. Santa Fe Institute, seminar, June 20, 2006
53. MIT, EECS seminar, May 11, 2006
54. Harvard University, Dana Farber Cancer Institute, Systems Biology seminar, April 27, 2006
55. Virginia Tech Corporate Research Center, April 10, 2006
56. Northwestern University, Industrial Engineering and Management Sciences seminar, April 7, 2006
57. University of Michigan, School of Information, STIET seminar, February 23, 2006
58. University of Rochester, Physics colloquium, February 22, 2006
59. William and Mary College, Physics colloquium, November 11, 2005
60. Cornell University, Applied Mathematics seminar, October 28, 2005
61. Perimeter Institute, Waterloo, Ontario, Institute colloquium, September 21, 2005
62. Harvard University, School of Public Health, seminar, May 2, 2005
63. Google Corporation, April 20, 2006
64. Indiana University, Complex Systems seminar, April 18, 2005
65. Princeton University, Ecology and Evolutionary Biology seminar, November 29, 2004
66. Syracuse University, Physics Colloquium, November 11, 2004
67. University of Maryland, Physics colloquium, November 9, 2004
68. NYU Stern School of Business, Information Systems seminar, October 14, 2004
69. University of Illinois, Urbana-Champaign, Physics colloquium, September 23, 2004
70. University of Oxford, Complex Systems seminar, May 11, 2004
71. Umeå University, Sweden, Physics seminar, May 6, 2004
72. Michigan State University, "Science on the Edge" seminar, April 30, 2004
73. University of Delaware, Mathematical Sciences colloquium, April 27, 2004
74. Georgia Tech, Applied Mathematics seminar, April 2, 2004
75. Harvard University, Kennedy School of Government, Colloquium on Complexity and Social Networks, March 15, 2004
76. Northwestern University, Engineering Science and Applied Mathematics colloquium, March 12, 2004
77. Microsoft Research, Theory Group seminar, February 13, 2004
78. Johns Hopkins University, Applied Mathematics and Statistics seminar, February 5, 2004
79. Wayne State University, Physics colloquium, January 22, 2004