

Curriculum Vitae

Nina H. Fefferman

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Rutgers University, New Brunswick, NJ 08901

Education

- 2004 PhD in Mathematical Biology from the Department of Biology, Tufts University. Advisor: J. Michael Reed
- 2001 MS in Mathematics from the Department of Mathematics, Rutgers University. Advisor: J. Beck
- 1999 AB in Mathematics from Princeton University

Positions

- 2012 - present Associate Professor, Dept. of Ecology, Evolution, and Natural Resources, Rutgers University
- 2008 - 2012 Assistant Professor, Dept. of Ecology, Evolution, and Natural Resources, Rutgers University
- 2011 - present Assistant/Associate Professor, School of Public Health, University of Medicine and Dentistry of New Jersey
- 2007 - present Research Assistant/Associate Professor, The Center for Discrete Mathematics and Theoretical Computer Science, Rutgers University
- 2005 - present Co-Director, Tufts University Initiative for the Forecasting and Modeling of Infectious Disease (InForMID), Tufts University School of Medicine
- 2005 - 2007 Visiting Research Associate, Center for Discrete Math and Theoretical Computer Science (DIMACS), Rutgers University
- 2005 Short Term Visitor, School of Natural Sciences, Institute for Advanced Study

Honors/Awards

- 2015 Coauthored an article chosen for the cover of *Phil Trans Roy Soc B* (issue 370.1665)
- 2012 Invited to Health Foo 2012
- 2011 Shared the Virginia Governor's Technology Award in the category of 'Cross-Boundary Collaboration in Modeling & Simulation' for our study 'Strategic Default in the Context of a Social Network: An Epidemiological Approach'.
- 2010 Speaker at TEDx Midatlantic
- 2009 Rutgers University Packard Fellow Nominee
- 2007 Coauthored an article chosen for the cover of *The Lancet Infectious Diseases* (vol. 7)
- Invited to give twelve Keynote, Plenary, or Public Lectures (see Invited Talks for details), over three continents

Media exposure (interviews and coverage):

Television/Online Video Broadcasts:

Discovery Channel “How Stuff Works” (Season 2: “Games Unboxed”), 2011
BBC World News Aug 21, 2007
CBS News Aug 22, 2007
Canada Television (CTV) Aug 21, 2007
AT&T Tech Channel Sept, 2007

Radio Broadcasts:

New Tech City, WNYC, Oct 22, 2014
PRI Studio 360, Jan 2013; Sept 2014
BBC UK News Aug 21, 2007
National Public Radio Podcast “Science Friday” Sept 3, 2007
AM900 CHML Sept, 2007
National Public Radio “All Things Considered” Oct 5, 2005

Print/Online Media (2005-present):

ABC News, ABS CBN News, Canadian Press (via CBC), Cell, The Daily Mail (UK), The Daily Telegraph (Australia), The Economist, Forbes, Fox News, G1.com.br (Brazil), O Globo (Brazil), Gazet Van Antwerpen (Belgium), NU.nl (Netherlands), Medical News Today, La Jornada (Mexico), New Scientist, Reuters, TIME, The Washington Post, Science News, Slate.com, the South African Star, Tech News World, *and many more...*

Research Support

Funded but not yet Active

2015-2016 National Academies Keck Futures Initiative (\$100,000) (Co-PI: Fefferman, PI: Gernat)
2015-2016 UK Science and Technology Facilities Council & US Dept. of Homeland Security (\$150,000) (PI: Fefferman)
2016-2017 US START Center (\$75,000) (PI: Fefferman)

Active

2015-2016 NSF EAGER (\$130,000) (Co-PI: Fefferman, PI: Fonseca)
2015-2016 NSF RAPID (\$21,003) (Rutgers PI: Fefferman)
2014-2016 Dept. of Homeland Security NGCI (\$100,000) (Project PI: Fefferman)
2012-2016 Dept. of Homeland Security (\$1,228,053) (PI: Fefferman)
2009-2016 Dept. of Homeland Security (\$275,000 to Fefferman Projects; \$5,000,000 Center Grant) (Project PI: Fefferman, Center PI: Roberts)

Completed

2011-2014 NSF (\$3,853,332) (Co-PI: Fefferman, PI: Curchitser)
2011-2012 UCUPER (\$22,500) (Co-PI: Fefferman, PI: Roberts)
2010-2012 Dept. of Homeland Security (\$384,000) (Project PI: Fefferman)
2010-2011 Dept. of Homeland Security (\$99,944) (Project PI: Fefferman)
2010 Dept. of Homeland Security (\$22,500) (Co-PIs: Fefferman, Carpenter, and Boros)
2009-2012 NSF (\$299,886) (Co-PI: Fefferman, PI: Ehrenfeld)
2009-2011 UCUPER (\$89,318) (PI: Fefferman)
2009-2010 USDA CSREES Multi-State Research Fund Project NE 1043 (PI: Gaugler, Co-I Fefferman)
2008 NIH SBIR NAID (\$99,990) (PI: Fefferman)
2008 Rutgers Climate and Environmental Change Initiative (\$5,000) (PI: Fefferman)
2008 Rutgers Academic Excellence Fellowship, Climate and Health Research Initiative (\$75,00) (PIs: Boros and Lathrop, Co-I: Fefferman)
2007 Dept. of Homeland Security (\$22,500) (Project PI: Fefferman)
2007 Dept. of Homeland Security (\$22,500) (Project PI: Fefferman)
2006 Tufts Summer Scholars Award (\$5,000) (PI: Fefferman)
2003-2004 NIH R01 Supplement (\$42,000) (Co-PI: Fefferman, PI: Griffiths)
2003-2004 Tufts Institute of the Environment (\$1,500) (CoIs: Fefferman and Reed)
2003 MASI Student Travel Award (\$500) (PI: Fefferman)
2003 TIES Student Travel Award (\$1,500) (PI: Fefferman)

Consultancies:

2009-present US Centers for Disease Control
2011-2012 Research Institute for Housing America Trust Fund
2004-2009 NIH U19 (Center PI: Gorski) T-cell Mediated Immunity
2004 National Defense University
2004 DARPA

Participation in Research Centers:

Center	Position	Description of Role
InForMID <i>(Tufts University Initiative for the Forecasting and Modeling of Infectious Diseases)</i>	Center Co-Director	Researcher and Administrative lead in the area of mathematical modeling of infectious disease epidemiology

CCICADA (US Dept of Homeland Security Command, Control, and Interoperability Center for Advanced Data Analysis)	Project PI	Principle Investigator into data analysis relating to social behavior in virtual/technologically enable environments, bio-security, and bio-inspired algorithms in cyber-security
DIMACS (The Center for Discrete Mathematics and Theoretical Computer Science)	Member	Active participant in working groups, collaborations, and conferences (including acting as organizer for multiple workshops/conferences/tutorials) in all areas of mathematical macrobiology

Publications (peer reviewed):

* = a student or post-doctoral researcher advised by Fefferman during the research effort reported

Journal Articles:

Published or In Press

1. Kebir*, A., N.H. **Fefferman**, S. Ben Miled. Understanding hermaphrodite species through game theory. (*In Press, Journal of Mathematical Biology*)
2. Gallos*, L., and N.H. **Fefferman**. The Effect of Disease-Induced Mortality on Structural Network Properties. *PLoS One*. DOI: 10.1371/journal.pone.0136704
3. Korczynski*, M., A. Hamieh*, J.H. Huh, H. Holm, S. R. Rajagopalan, and N.H. **Fefferman**. DIAMoND: Distributed Intrusion/Anomaly Monitoring for Nonparametric Detection. *CCCN 2015: 24th International Conference on Computer Communications and Networks, IEEE, 2015*. (Note: this is the proceeding of a conference, not a journal, but is equivalent to journal publication for the field of computer science; in keeping with the conventions of Biology, Fefferman is last author as PI on the sponsoring grant that funded the research.)
4. Burkhalter*, J.C., N.H. **Fefferman**, and J.L. Lockwood. The impact of personality on the success of prospecting behavior in changing landscapes. *Current Zoology*. 61:557-568.
5. Robinson*, O., J. Lockwood, O. Stringham*, and N.H. **Fefferman**. 2015. A Novel Tool for Making Policy Recommendations Based on PVA:Helping Theory Become Practice. *Conservation Letters*. 8(3):190-198.
6. **Fefferman**, N.H. and E.N. Naumova. 2015. Dangers of vaccine refusal near the herd immunity threshold: a modelling study. *Lancet Infectious Diseases*. S1473-3099(15)70130-1
7. Maslo, B. and N.H. **Fefferman**. A Case Study of Bats and White-Nose Syndrome Demonstrating How to Model Population Viability with Evolutionary Effects. *Conservation Biology* DOI: 10.1111/cobi.12485

8. Parham, P E. J. Waldo, G.K. Christophides, D. Hemming, F. Agosto, K. J. Evans, N.H. **Fefferman**, H. Gaff, A. Gumel, S. LaDeau, S. Lenhart, R.E. Mickens, E. Naumova, R. Ostfeld, P. Ready, M. Thomas, J. Velasco-Hernandez, E. Michael. 2015. Climate, Environmental, and Socioeconomic Change – Weighing up the Balance in Vector-Borne Disease Transmission. *Philosophical Transactions of the Royal Society B*. 370.1665 (2015): 20130551.
9. Egizi, A., N.H. **Fefferman**, and D. M. Fonseca. 2015. Evidence that implicit assumptions of “no evolution” of disease vectors in changing environments can be violated on a rapid timescale. *Philosophical Transactions of the Royal Society B*. 370.1665 (2015): 20140136.
10. Greening*, B., N. Pinter-Wollman, and N.H. **Fefferman**. 2015. Higher-Order Analysis of Information Sharing and Knowledge Capacity in Animal Social Groups *Current Zoology*. 61(1): 114–127.
11. Gallos*, L. and N.H. **Fefferman**. 2014. Revealing effective classifiers through network comparison. *Europhysics Letters*. 108(3): 38001
12. Lofgren*, E.T., R.W. Moehring, D.J. Anderson, D.J. Weber, and N.H. **Fefferman**. 2014. A Mathematical Model to Evaluate the Routine Use of Fecal Microbiota Transplantation to Prevent Incident and Recurrent *Clostridium difficile* Infection. *Infection Control and Hospital Epidemiology*. 35(1):18-27.
13. Greening*, B. and N.H. **Fefferman**. 2014. Evolutionary Significance of the Role of Family Units in a Broader Social System. *Nature Scientific Reports*. 4: 3608
14. Seiler, M.J., Collins, A.J., and N.H. **Fefferman**. 2013. Strategic Mortgage Default in the Context of a Social Network: An Epidemiological Approach. *Journal of Real Estate Research* 35(4).
15. Robinson*, O.J., N.H. **Fefferman**, and J.L. Lockwood. 2013. How to effectively manage invasive predators to protect their native prey. *Biological Conservation* 165: 146-153.
16. **Fefferman**, N.H., and L.M. Romero. 2013. Can physiological stress alter population persistence? A model with conservation implications. *Conservation Physiology*. 1(1): cot012. doi: 10.1093/conphys/cot012
17. Moorthy, M., D. Castronovo, A. Abraham, S. Bhattacharyya, S. Gradus, J. Gorski, Y.N. Naumov, N.H. **Fefferman**, and E.N. Naumova. 2012. Deviations in influenza seasonality: odd coincidence or obscure consequence? *Clinical Microbiology and Infection*. 18(10):955-962.
18. Hock*, K. and N.H. **Fefferman**. 2012. Social organization patterns can lower disease risk without associated disease avoidance or immunity. *Ecological Complexity*. 12:34–42.
19. Hock*, K. and N.H. **Fefferman**. 2011. Violating Social Norms when Choosing Friends: How Rule-Breakers Affect Social Networks. *PLoS One*. 2011; 6(10): e26652

20. Hock*, K. and N.H. **Fefferman**. 2011. Extending the role of social networks to study social organization and interaction structure of animal groups. *Annales Zoologici Fennici*. 48(6):365-370.
21. Kafai, Y.B. and N.H. **Fefferman**. 2010. Virtual Epidemics as Learning Laboratories in Virtual Worlds. *Journal of Virtual Worlds Research*. 3(2):2-15.
22. Hock*, K., K.L. Ng, and N.H. **Fefferman**. 2010. Systems approach to studying animal sociality: individual position versus group organization in dynamic social network models. *PLoS One*. 5(12): e15789.
23. **Fefferman**, N.H. and E.N. Naumova. 2010. Innovation in Observation: A Vision for Early Outbreak Detection. *Emerging Health Threats*. 3:e6. doi: 10.3134/ehjtj.10.006
24. Lofgren*, E.T., J.B. Wenger, N.H. **Fefferman**, D. Bina, S Gradus, S. Bhattacharyya, Y.N. Naumov, J. Gorski, E.N. Naumova. 2010. Disproportional Effects in Populations of Concern for Pandemic Influenza: Insights from Seasonal Epidemics in Wisconsin, 1967-2004. *Influenza and Other Respiratory Diseases*. 4:205-212.
25. Phan, L., N.H. **Fefferman**, D. Hui, and D. Brugge. 2010. Impact of Street Crime on Boston Chinatown. *Local Environment*. 15(5):481-491.
26. Reed, J.M., N.H. **Fefferman**, and R.C. Averil-Murray. 2009. Vital Rate Sensitivity Analysis and Management Implications for Desert Tortoise. *Biological Conservation*. 14(12): 2813-3222.
27. Wilson-Rich, N., Spivak, M., **Fefferman**, N.H., Starks, P.T. 2009. Genetic, Individual, and Group Facilitation of Disease Resistance in Insect Societies. *Annual Reviews of Entomology*. 54:405-23.
28. **Fefferman**. N.H. 2008. Biological Experimentation *in silico*. *Annales Zoologici Fennici*, 45: 367-368.
29. Lofgren*, E., M. Senese*, J. Rogers* and N.H. **Fefferman**. 2008. Pandemic Preparedness Strategies for School Systems: Is Closure Really the Only Way? *Annales Zoologici Fennici*, 45: 449-458.
30. **Fefferman**, N.H. and K.L. Ng*. 2007. How Disease Models on Static Graphs Fail to Approximate Epidemics in Shifting Social Networks. *Physical Review E*. 76:031919. (This article was selected for reprinting by the Virtual Journal of Biological Physics Research 2007)
31. Lofgren*, E. and N.H. **Fefferman**. 2007. The Untapped Potential of Virtual Game Worlds to Shed Light on Real World Epidemics. *The Lancet Infectious Diseases*. 7:625–629. (article content was the cover of the journal)
32. Lofgren*, E., N.H. **Fefferman**, Y.N. Naumov, J. Gorski and E.N. Naumova. 2007. Influenza Seasonality: Underlying Causes and Modeling Theories. *Journal of Virology*, 81(11):5429-5436.
33. Lofgren*, E., N.H. **Fefferman**, M. Doshi and E.N. Naumova. 2007. Assessing Seasonal Variation in Multisource Surveillance Data: Annual Harmonic Regression. *Lecture Notes in Computer Science*. BioSurveillance 2007. eds D. Zeng et al. 4506:114-123.

34. **Fefferman**, N.H. and K.L Ng*. 2007. The role of individual choice in the evolution of social complexity. *Annales Zoologici Fennici*, 44:58-69.
35. **Fefferman**, N.H., J.F.A. Traniello, R.B. Rosengaus and D.V. Calleri. 2007. Disease Prevention and Resistance in Social Insects: Modeling the Survival Consequences of Immunity, Hygienic Behavior and Colony Organization. *Behavioral Ecology and Sociobiology*, 61:565-577.
36. Starks, P.T.B. and N.H. **Fefferman**. 2006. Polistes Nest Founding Behavior: a Model for the Selective Maintenance of Alternative Behavioral Phenotypes. *Annales Zoologici Fennici*, 43:456-467.
37. **Fefferman**, N.H., and E.N. Naumova. 2006. Combinatorial Decomposition of an Outbreak Signature. *Mathematical Biosciences*, 202(2):269-287.
38. **Fefferman**, N.H. and J.M. Reed. 2006. A Vital Rate Sensitivity Analysis that is Valid for Non-Stable Age Distributions and for Short-Term Planning. *The Journal of Wildlife Management*, 70(3):649-656.
39. **Fefferman**, N.H., and P.T.B. Starks. 2006. A Modeling Approach to Swarming in Honey Bees. *Insectes Sociaux*, 53(1):37-45.
40. **Fefferman**, N.H., E.A. O'Neil, and E.N. Naumova. 2005. Confidentiality vs Confidence: The aggravation of aggregation as a remedy in public health. *Journal of Public Health Policy*, 26(4):430-449.
41. **Fefferman**, N.H., J. Jagai, and E.N. Naumova. 2004. Two - Stage Wavelet Analysis Assessment of Dependencies in Time Series of Disease Incidence. *Proceedings of the 2004 Conference of the International Environmetrics Society*

Under Review:

42. Gallos*, L. and N.H. **Fefferman**. Simple and efficient self-healing strategy for damaged complex networks. (Submitted)
43. Maslo, B., R. Valentin, K Leu, K Kerwin, A Bevan, G.C. Hamilton, N.H. **Fefferman**, and D.M. Fonseca. ChiroSurveillance: The Use of Native Bats to Detect Invasive Agricultural Pests (Submitted)
44. Greenbaum*, G. and N.H. **Fefferman**. The potential applications of network methods to model selection-migration dynamics. (Submitted)
45. Lemanski*, N.J. and N.H. **Fefferman**. Expanding the evolutionary theory of aging: honeybees as a test case for an optimal decision making model of senescence. (Submitted)
46. Lofgren*, E. and N.H. **Fefferman**. Leveraging Insight from Centuries of Outbreak Preparedness to Improve Modern Planning Efforts. (Submitted)
47. Verma, S., A. Hamieh*, J.H. Huh, S. R. Rajagopalan, M. Korczynski*, H. Holm and N.H. **Fefferman**. Stopping amplified DNS DDoS attacks through query rate sharing between DNS resolvers. (Submitted)
48. Villiard, A., N.H. **Fefferman**, and R. Gaugler. First Demonstration of Environmentally Adaptive Paternal Effects in Mosquitos. (Submitted)
49. Lofgren*, E., A. Egizi, and N.H. **Fefferman**. Patients as Patches: Urban Ecology and Epidemiology in Healthcare Environments. (Submitted)

50. Shiri*, T., L. Gallos*, and N.H. **Fefferman**. Determining which selective pressures may have shaped the evolution of social organization. (Submitted)
51. Gallos*, L.K., B. Maslo, and N.H. **Fefferman**. The Impact of Social Network Disintegration on Population Viability. (Submitted)
52. Robinson*, O.J., O.P. Jensen, M.M. Provost, S. Huang, N.H. **Fefferman**, A. Kebir and J.L. Lockwood. Evaluating the vulnerability of sex-changing fish to harvest: A game-theoretic approach. (Submitted)
53. DeNegre*, A.A. and N.H. **Fefferman**. The Impact of AIDS Prevalence on the Emergence of Antibiotic Resistance. (Submitted)
54. **Fefferman**, N.H., N. Li, P. Blue and A.A. Yakubu. Schrödinger's Cat and Epidemiological Modeling: Human behavior and the estimation of etiological parameters from reported outbreaks. (In Revision)
55. **Fefferman**, N.H. and J.N. Kibambe. A Household Resource Model for Epidemic Control in Financially Constrained Populations. (In Revision)
56. **Fefferman**, N.H., K. Hock*, and K.L. Ng*. Species-specific social behavior affects disease spread through an ecosystem. (In Revision)
57. Kim*, J. and N.H. **Fefferman** Bounds on the Threshold Probability for Disease Spread in Static and Dynamic Networks. (In Revision)

In Preparation for Submission for Review:

58. Lofgren*, E. and N.H. **Fefferman**. The Impact of Climate Change on Endemic Rotavirus in the Developed World. (In Preparation)
59. **Fefferman**, N.H. Worker Task Allocation in Social Insect Colonies: Should the strategy depend on disease presence? (In Preparation)
60. **Fefferman**, N.H. and K.L. Ng*. The Effects of Disease Avoidance Behavior on Organizational Success in Social Populations. (In Preparation)
61. **Fefferman**, N.H. and P.T.B. Starks. Drone Tenure in Honey Bee Colonies: A Game Theoretic Approach. (In Preparation)
62. **Fefferman**, N.H., Kebir*, A., and A. Pritsker*. Integrating Game Theory into the Epidemiology of Sexually Transmitted Infections: The role of risk perception in disease dynamics. (In Preparation)

Book Chapters:

Published or In Press

63. **Fefferman**, N.H. and C. Hemmings. (*In Press*) Privacy, Policy, and Public Perception: Are we preserving the wrong privacy? *in* Technology and CyberSecurity eds. B. Edwards, and J. Kielman.
64. **Fefferman**, N.H. (*In Press*) Beyond Networks: Exploring Social Resilience with MultiLayer Networks and Topological Objects *in* Technology and CyberSecurity eds. B. Edwards, and J. Kielman.

65. **Fefferman**, N.H. and L.M. Fefferman. 2011. Mathematical Macrobiology: An Unexploited Opportunity in High School Education. *in* Biomath in the Schools. eds. M.B. Cozzens, and F.S. Roberts. DIMACS Series in Discrete Mathematics and Theoretical Computer Science. Vol 76. American Mathematical Society.
66. Jagai, J., N.H. **Fefferman** and E.N. Naumova. 2011. Waterborne Disease Surveillance. *in* Encyclopedia of Environmental Health. eds. J. Nriagu, S. Kcew, T. Kawamoto, J. Patz, and D. Rennie. Elsevier Science. 1st edition
67. Ji, S., W.A. Chaovalitwongse, N.H. **Fefferman**, W. Yoo, and J.E. Perez-Ortin. 2009. Mechanism-based Clustering of Genome-wide RNA Levels: Roles of Transcription and Transcript-Degradation Rates. *in* Clustering Challenges in Biological Networks. eds. S. Butenko, P.M. Pardalos, and W.A. Chaovalitwongse. World Scientific Publishing Company.
68. **Fefferman**, N.H. and J.F.A. Traniello. 2008. Social Insects as Models in Epidemiology: Establishing the Foundation for an Interdisciplinary Approach to Disease and Sociality. *in* Organization of Insect Societies: From Genome to Sociocomplexity eds J. Gadau and J. Fewell. Harvard University Press
69. MacLeod, N., N. Ortiz, N.H. **Fefferman**, W. Clyde, C. Schuler, and J. MacLean. 2000. Phenotypic Response of Foraminifera to episodes of global environmental change. *in* Biotic Response to Global Change. eds S.J. Culver and P. Rawson. Cambridge University Press

Edited Volumes:

70. **Fefferman**, N.H. (Ed.) (2008) *Annales Zoologici Fennici* 45(5)

Training and Teaching:

Undergraduate Researchers:

Jessica Beck, Shyretha Brown, Danika Chari, Kaige Chen, Ian Clark, Liz Davis, Anne Eaton, Taylor Eisenstein, Derek Hansen, David Haycraft, John Huffman, John Kim, Edward Lee, Somair Malik, Andrew McConvey, Jeffrey Mandell, Zain Paracha, Luke Postle, Lauren Prince, Asya Pritsker, Cathy Reis, Jeremiah Rogers, Bolanle Salaam, Nicole Scholtz, Margaret Senese, Joshua Smith, Andrew Sohn, Kim Stanek, Johanna Tam, Colleen Thiersch, Barton Willage, Immanuel Williams, Nakeya Williams, Barry Walker, Yi Ming Yu, Yongqing Yuan, Stefanie Yuen, James Xue, Bobby Zandstra

Graduate Researchers:

*(advisor for work on funded research projects – not primary dissertation advisor;
* = special case)*

Kevin Aagard, Curtis Burkhalter, Huilan Chang, Ashley Crump, Alison Golinski, Candice JeanLouis, Ariel Kruger, Di Li, Eric Lofgren*, Nicholas Lorusso, Adam Marszalek, Anthony Ogbuka, Paul Raff, Orin Robinson, Rajat Roy, Liliana Salvador, Tinevimbo Shiri, Alex Thorn, Rafael Valentine, Alex Villiard, Orion Weldon

(primary research advisor to)

Ashley DeNegre, Brad Greening, Michael Lan, Natalie Lemanski, Alex Mayberry, Agnesa Redere, Samantha Schwab, Oliver Stringham, Karen Wylie

Post-Doctoral Researchers: (* = current)

Dr. Lazaros Gallos, *Dr. Ali Hamieh, Dr. Karlo Hock, Dr. Cindy Hui, Dr. Amira Kebir, Dr. Maciej Korczynski, Dr. Kah Loon Ng, Dr. Manuel Quisimondo*, Dr. Peng Zhong

Courses Taught:

- Evolution, Disease, and Medicine (ENR110 – Rutgers University) Fall each year 2009 – continuing (exception – sabbatical Fall 2014-Spring 2015)
- Conversational Bio-Mathematical Modeling (ENR 428 – Rutgers University) Spring 2011 – continuing (exception – sabbatical Fall 2014-Spring 2015)
- Introduction to Epidemiological Modeling (ENR 603 – Rutgers University) Fall each year 2009 – continuing (exception – sabbatical Fall 2014-Spring 2015)
- Introduction to Modeling Ecology, Evolution, and Epidemiology (ENR 604 – Rutgers University) Spring each year 2010 – continuing (exception – sabbatical Fall 2014-Spring 2015)
- Epidemiology (CHP 646 – Online Course – Old Dominion University) Spring 2009
- Elements of Data Analysis and Epidemiology (CMPH 343 – Tufts University School of Medicine) Spring 2006

Professional Memberships:

Association for Women in Mathematics

CCICADA (The Command, Control, and Interoperability Center for Advanced Data Analysis – Dept. of Homeland Security CoE)

Complex Systems Society

DyDAn (The Center for Dynamic Data Analysis – Dept. of Homeland Security CoE)

DIMACS (The Center for Discrete Mathematics and Theoretical Computer Science)

International Union for the Study of Social Insects

Society for Conservation Biology

Society for Industrial and Applied Mathematics

Society for Mathematical Biology

Invited Presentations:

2015

“Linear Algebraic Tools in Conservation Ecology,” Simon A. Levin Mathematical, Computational and Modeling Sciences Center Seminar, Tempe, AZ.

“Applications of Homology Theory to Animal Communication Systems,” Mathematics and Statistics Colloquium, Arizona State Univ., Tempe, AZ.

“Trade-offs Between Collaboration and Infection Risk: Can ‘social distancing’ improve colony function?” Conference on Complex Systems 2015, Tempe, AZ.

“The Benefits of Ongoing Dynamics in Self-Organizing Social Systems,” Conference on Collective Dynamics and Evolving Networks, Bath, UK.

Plenary Talk: Exploiting the Complexity of Identity to Infiltrate Clandestine Groups – Lessons from a LARP, CyDentity Conference, CCICADA, New Brunswick, NJ.

“Incorporating Evolutionary Rescue into Population Viability Models,” Mathematics of Planet Earth: Workshop on Management of Natural Resources, Washington D.C.

“Distributed Detection Algorithms for Real-Time Maritime CyberSecurity,” Joint CCICADA & AMU Conference on Maritime CyberSecurity, New Brunswick, NJ.

“The Definition of Communication: One way biology and math people accidentally talk past each other and what we might be able to do to fix it,” Annual Meeting, Society for Integrative and Comparative Biology, West Palm Beach, FL.

2014

“BioInspired Anomaly Detection: Social Insects and Network Security,” Dept. of Homeland Security Science and Technology HSARPA CyberSecurity Division Research and Development Showcase and Technical Workshop, Washington D.C.

“n-TANGLE: a new method for comparing networks across scales” Workshop on Advances in Discrete Networks, Dept. of Mathematics, Univ. of Pittsburgh, Pittsburgh, PA.

Keynote Address: “Virtual Worlds Helping Public Health Preparedness,” New Jersey Health Care Quality Institute Annual Meeting, Trenton, NJ.

“A Mathematician’s Role in Fighting Ebola,” Saint Ann’s School, Brooklyn, NY.

“Provable Boundaries on Disease Outbreaks in Self-Organizing Social Networks,” The Duke University Mathematical Biology Colloquium, Durham, NC.

Keynote Address: “Designing your own role: Women in STEM,” Tufts University Graduate Student Luncheon for Women in Science, Medford, MA.

“Division of Labor as an Adaptation to Combat Disease Risks?” The Seventh International Symposium on Biomathematics and Ecology: Education and Research (BEER), Claremont, CA.

“How dynamic networks affect disease transmission,” The BioCircuits Institute, UCSD, San Diego, CA.

“The Evolution of Social Complexity,” Plant Biology Dept. Seminar, Univ. of Vermont, Burlington, VT.

“Provable Boundaries on Disease Outbreaks in Self-Organizing Social Networks,” Math Dept. Seminar, Univ. of Tennessee at Knoxville, TN.

“Mathematics, Optimization, and the Evolution and Behavior of Social Insects,” Math Dept. Junior Colloquium, Univ. of Tennessee at Knoxville, TN.

“The Life of a Mathematical Researcher,” Saint Ann’s School, Brooklyn, NY.

“Mathematics, Optimization, and the Evolution and Behavior of Social Insects,” Social Insect Research Group Seminar, School of Life Sciences, Arizona State Univ., AZ.

“N-tangle: A Network Comparison Method,” Workshop on Animal Social Networks, NIMBioS, TN

2013

- “Evolutionary pressures, Infectious Diseases, and Self-Organizing Social Systems,” Evolutionary Studies Seminar, Co-Sponsored by the Collective Dynamics of Complex Systems Research Group, the Undergraduate Math Club, Upsilon Pi Epsilon, and Pi Mu Epsilon, SUNY Binghamton, NY.
- “BioInspired Anomaly Detection,” DHS CyberSecurity PI Meeting, Arlington, VA.
- “Mathematics, Evolutionary Biology, Epidemiology, and National Security”, Saint Ann’s School, Brooklyn, NY.
- “Evolution of Reproductive Timing and Social Organization in Honey Bees,” Scientific Learning Forum at FMC, Ewing, NJ.
- “Crowd Sourcing WoW: A Case Study in Improving Pandemic Preparedness,” Annual George M. Sideris Biology Conference, LIU, Brooklyn, NY.

2012

- Public Lecture:** “Math, Complexity, and Social Groups: Using math to understand the nature of society,” Campus Life Enrichment Committee (CLEC) Lecture, Georgia Southern Univ., GA.
- “How and Why Static Approximations Can Fail to Give Adequate Insight into Processes on Dynamic Networks,” Math Dept. Colloquium, Georgia Southern Univ., GA.
- “Theoretical Worlds: An Exploration of Models and Model Systems,” Tufts Univ, Dept. of Civil and Environmental Engineering Seminar Series, Medford, MA.
- “Help, my avatar is sick!” Panel Talk, SXSW, Austin, TX.
- “WISE – Women, Ignore Silly Expectations!” 2012 WISE Conference, Texas A&M, TX.

2011

- “The Evolution of Social Complexity,” CUNY Initiative for the Theoretical Sciences Workshop on A Unified Theory of Evolution, CUNY, NY.
- “Balancing Workforce Productivity Against Disease Risks for Environmental and Infectious Epidemics,” Math Dept. Seminar, Univ. of Ghana, Legon, Ghana.
- “Selective Pressures from Disease on Social Behavior in Hosts,” DIMACS/MBI US - African BioMathematics Initiative: Workshop on Genetics and Disease Control, Elmina, Ghana.
- Plenary Address:** “The Future of Technology and Knowledge,” Next-Generation Communications Interoperability Workshop, Chicago, IL.
- “Virtual Worlds and Real Epidemics - Insights from WoW’s Corrupted Blood Plague,” E-Virtuoses International Conference on Serious Games, Valenciennes, France.
- Plenary Address:** “Disease Robustness and Evolutionary Selective Pressures on Social Organization in Eusocial Insects,” Mathematical Biosciences Institute Workshop on Insect Self-Organization and Swarming, Ohio State Univ., OH.
- “Hakkar’s Corrupted Blood Plague: How an Outbreak in WoW is Helping Epidemiologists Create Better Disease Models,” Game Developer’s Conference 2011, San Francisco, CA
- “Exploring the Role of Behavior in Infectious Disease Dynamics: Mathematical Insights from World of Warcraft and other Virtual Worlds,” DIMACS/CCICADA Student

Workshop on Where the Mathematical and Computational Sciences Meet Society,
Rutgers University, NJ

“Multi-Dimensional Data and the Influence of Human Behavior in Biosurveillance for
Infectious Disease Outbreaks,” Global Biosurveillance Conference: Enabling
Science and Technology – 2nd Meeting in the Biological Threat Non-Proliferation
Conference Series, Santa Fe, NM

2010

“Distributed Algorithms for Collective Visualization of Data,” Visualanalytics
Workshop 2010, Imperial College London, UK

“The Importance of Behavioral Dynamics on Disease Burden,” Southern African
Wildlife College, South Africa

“The Impact of Stress on Populations,” DIMACS Advanced Study Institute on
Conservation Biology, Limpopo, South Africa

“Social Behavior in Virtual Worlds,” Panel Discussant – InPlay 2010, Toronto, Canada

“Self-Organizing Networks, Social Complexity, and Disease Dynamics,” Rensselaer
Polytechnic Institute, NY

“Playing with Plague: Exploring Disease Dynamics from Within,” 2010 AAAS Annual
Meeting, San Diego, CA

“Epidemiological Pressures on the Evolution of Social Complexity,” Mathematical
Methods in Systems Biology, Tel Aviv, Israel

2009

“Information Theoretic Tool for Biosurveillance,” CCICADA Kickoff Meeting, Rutgers
Univ., NJ

“Perspectives, Challenges, and Creativity in Understanding Behavioral Epidemiology,”
Workshop on Behavioral Epidemiology, Rutgers Univ., NJ

“Evolutionary Implications of Epidemics on Social Behavior,” Evolutionary Genetics
and Genomics at Rutgers, Rutgers Univ., NJ

Panel participant and Speaker on Popular Culture and Science, Sheffield Documentary
Film Festival '09, Sheffield, United Kingdom

Keynote Address: “Epidemiological Insights from Virtual Worlds,” Life Science
Dialogue Heidelberg, - Inaugural Conference, Germany

“Social Stability and Success: A new concept in self-organizing systems and preferential
attachment,” Office of Naval Research Workshop on Complex Systems, Institute
for Pure and Applied Mathematics, Los Angeles, CA

“The Impact of Household Capital Models on Targeted Epidemiological Control
Strategies for Diseases with Age-Based Etiologies,” Makerere Univ., Kampala,
Uganda

Keynote Address: “Hakkar's Corrupted Blood Plague: How an Outbreak in World of
Warcraft is Helping Epidemiologists Create Better Disease Models,” Games for
Health – Virtual Worlds, Boston, MA

“Network Representations and the Evolution of Social Complexity,” Frontiers in
Applied and Computational Mathematics, New Jersey Institute of Technology, NJ

“Mathematical Optimization, Evolutionary Sociobiology, and Eusocial Insects,”
Conference on The Power of Analysis, Princeton Univ., NJ

“Mathematical Insights into Behavioral Epidemiology,” Univ. of Texas Health Science Center, Houston, TX

“Basics of Mathematical Modeling,” Mosquito Modeling Made Easy Day, Center for Vector Biology, Rutgers Univ., NJ

“Mathematical and Computational Methods in Epidemiology and BioSurveillance,” Jackson State University, MS

“Mathematics, Optimization, and the Evolution and Behavior of Social Insects,” UNC, Chapel Hill, Applied Math, NC

“Network models in Epidemiology and Sociobiology: Introduction, Overview, and Recent Advances,” Mathematical Sciences, RPI, NY

2008

“Social Behavior and the Dynamics of Corrupted Blood,” Rice University/Games for Health, Houston, TX

“Possible Selective Mechanisms for the Evolution of Disease-defensive Social Organizations,” Ecology and Evolution Seminar, Boston Univ., MA

“Behavioral Epidemiology in Virtual Worlds: Exploiting the virtual experience,” Advanced Technology Applications for Combat Casualty Care 08; Telemedicine and Advanced Technologies Research Center Medical Simulation & Training Technology

“Recent Advances in the What, How and When of Network Models in Infectious Disease Epidemiology,” SIAM 2008, CA

“World of Warcraft Corrupted Blood Disease: Epidemiological Observations and Findings,” Games for Health, Baltimore, MD

“Computational Ecology: The Evolution of Sociality,” Frontiers in Applied and Computational Mathematics, New Jersey Institute of Technology, NJ

Plenary Talk: “Self-organizing social behavior and disease-defensive organizational strategies in social species,” Complexity 2008, Univ. Illinois Urbana, IL

“From the Individual to the Population: Modeling the many levels of evolutionary fitness in social species,” Dept. of Ecology and Evolution and Natural Resources, Rutgers Univ., NJ

“Individual Decisions, Group Efficiency,” ExxonMobil, Clinton, N.J.

2007

Public Lecture: “Virtual Games, Real Epidemics: Can We Learn Real-Life Lessons in BioDefense from Online Games?” Biosecurity, Biotechnology and Global Health Seminar Series, Program on Science and Global Security, Princeton Univ., NJ

“Disease on Networks: Can Static Representations Capture the Full Complexity of a Dynamic Process?” NDSSL Seminar Series, Virginia Bioinformatics Institute, Virginia Tech, VA

Public Lecture: “Real People, Virtual Worlds: Watching a Plague Unfold,” Institute for Mathematical Sciences, National Univ. of Singapore

“The Continued Mystery of Regular, Old, Annual Flu,” Workshop on Mathematical models for the Study of the Infection Dynamics of Emergent and Re-emergent Diseases in Humans, Institute for Mathematical Sciences, National Univ. of Singapore

- “Epidemics and the Evolution of Social Complexity,” Program in Ecology and Evolution Seminar Series, Rutgers Univ., NJ
- “Playing Games at School: Parents, Public Schools, and Children's Health,” DIMACS Workshop on Game Theory in Epidemiology and Ecology, Rutgers Univ., NJ
- “Analyzing Entropy in Biosurveillance,” U.S. Dept. of Homeland Security research briefing, Washington D.C.
- “Fantastic Problems in Mathematical Ecology,” DIMACS Bio-Math Connection Field Testers Workshop, Rutgers Univ., NJ
- “Does Securing Infrastructure Against Workforce-Depletion Depend on Whether the Risk is Environmental or Infectious?” DIMACS Workshop on Mathematical Modeling of Infectious Diseases in Africa, Univ. of Stellenbosch, South Africa
- “Social interaction and disease dynamics,” Workshop on Analysis of Time Series Data in Epidemiology, Tufts Univ. School of Medicine, Boston, MA
- “The Behaviors of Individuals and Populations,” Working Group on Spatio-Temporal and Network Modeling of Diseases, ICMS, Edinburgh, Scotland
- “The Evolution of Complexity in Already Social Groups,” Dept. of Ecology and Evolutionary Biology, Princeton Univ., NJ
- “Disease as a Selective Pressure and the Evolution of Social Complexity,” Applied Biomathematics, Stony Brook, NY
- “Vital Rate Sensitivity Analysis: A new method for population viability analysis - Two examples of its use,” Applied Biomathematics, Stony Brook, NY
- “Disease as a Selective Pressure and the Evolution of Social Complexity,” Morin Lab, Dept. of Ecology, Evolution and Natural Resources, Rutgers Univ., NJ

2006

- “The Role of Individual Choice in the Evolution of Social Complexity and its Implications Towards the Emergence of Zoonotic Infections,” DIMACS Computational and Mathematical Epidemiology Seminar, Rutgers Univ., NJ
- “Preparing Societal Infrastructure Against Disease-Related Workforce Depletion,” DIMACS Workshop on Facing the Challenge of Infectious Diseases in Africa, University of the Witwatersrand, South Africa
- “Fantastic Problems in Mathematical Ecology,” DIMACS Bio-Math Connect Institute for High School Teachers, Denver, CO
- “Societal Bio-defense - How Can we Accomplish Safety, Stability and Efficiency?” SIAM Annual Meeting, Boston, MA
- “When females should stop supporting lazy males: mathematics and honey bees?” DIMACS REU Seminar Series, Rutgers Univ., NJ
- “Selected Problems in Epidemiology.” DIMACS Tutorial on Data Mining and Epidemiology, NJ
- “How Would Termites Prepare for Pandemic Bird Flu and What Should We Learn From Them?” Joint Dept. of Entomology and Center for Infectious Disease Dynamics Seminar, Penn State Univ., PA
- “Different Scales of BioDefense - Can societies be both safe and efficient?” DIMACS Computational and Mathematical Epidemiology Seminar, Rutgers Univ., NJ

2005

- “Termites in the Nation’s Service,” DIMACS Computational and Mathematical Epidemiology Seminar, Rutgers Univ., NJ
- “Applications of Self-Organizing Systems to Epidemiology.” DIMACS Mixer Series, Rutgers Univ., NJ
- “Disease Signatures: A New Combinatorial Method for Epidemiology,” DIMACS Computational and Mathematical Epidemiology Seminar, Rutgers Univ., NJ
- “Fantastic Problems in Mathematical Ecology,” DIMACS Bio-Math Connect Institute for High School Teachers, Rutgers Univ., NJ
- “How Complex Systems Can Simplify a Complex Problem: What Epidemiologists Can Learn From Insects,” Institute for Advanced Study, Center for Systems Biology Seminar Series, NJ

2004

- “Incorporating Behavior and Social Structure into Pathogen Defense Strategies. Conference on Innate Immunity for Biodefense,” National Defense University's Center for Technology and National Security Policy (CTNSP) & the Department of Defense, Washington D.C.

Keynote Address: “Social Insects, Immunocompetence and Epidemiology: A Model System for Systems Modelers,” Vanderbilt Medical School, Dept. of Microbiology and Immunology Annual Retreat, TN

- “Disease and Immunocompetence in Group-Living Animals: Implications for Human Epidemiology,” DARPA/DSO Workshop on Endogenous Defense, VA

Contributed Presentations

- 2008. “An Interdisciplinary Framework for Defining and Distinguishing Security Desiderata for Personally Sensitive Information,” DIMACS/DyDAn Workshop on Internet Privacy: Facilitating Seamless Data Movement with Appropriate Controls
- 2006. “A Vital Rate Sensitivity Analysis (VRSA) for Non-stable Age Distributions and Short-term Planning,” North American Ornithological Conference
- 2004. “A Mathematical Analysis of Reproductive Fission,” North American Section of the International Union for the Study of Social Insects (with published abstract)
- 2004. “Two-stage Wavelet Analysis Assessment of Dependencies in Time Series of Disease Incidence,” The 2004 Conference of the International Environmetrics Society (with published abstract)
- 2004. “Mathematical Modeling of Behavior and Ecology in Social Insects: Social mechanisms of pathogen control in termite colonies,” Departmental Research Seminar, Tufts Univ.
- 2003. “Modeling Waterborne Infectious Outbreaks: When, where and how bad will they be?” The 2003 Conference of the International Environmetrics Society (with published abstract)
- 2003. “Modeling Disease Resistance through Social Interactions in Termites,” The 2nd Conference on the Mathematics and Algorithms of Social Insects (with published abstract)

Other Experience/Service:

- 2014 ARO grant proposal reviewer
- 2013-cont. Member of Scientific Advisory Board for MBI (the Mathematical Biosciences Institute at Ohio State)
- 2013 NIH grant proposal reviewer
- 2013-cont. Co-Organizer NIMBioS Working Group on Climate Change and Vector-borne Diseases
- 2013-cont. Invited Participant Joint NIMBioS-SESYNC Working Group on Human Risk Perception and Climate Change
- 2012 Invited Grant Proposal Reviewer for the United States – Israel Binational Science Foundation
- 2012 US Environmental Protection Agency FIFRA Scientific Advisory Panel (SAP) on Pollinator Risk Assessment Framework
- 2011 Invited Participant - External Expert Review Panel for Bioscience Research and Development at Los Alamos National Laboratory
- 2011 Program Committee Member, The Third International UKVAC Workshop on Visual Analytics (VAW 2011)
- 2011 NSF grant proposal reviewer
- 2011 Co-Organizer DIMACS/MBI US - African BioMathematics Initiative: Advanced Study Institute and Workshop on Genetics and Disease Control
- 2010 Organizer of the DIMACS Mini-Workshop on ‘Emergent Properties of Dynamic Biological Networks’
- 2010 Lecturer at DIMACS/MBI US - African BioMathematics Initiative: Workshop and Advanced Study Institute on Conservation Biology
- 2010 Organizer of the DIMACS Mini-Workshop on ‘Game-theoretic Approaches to Medical Prognosis’
- 2010 NSF grant reviewer/panel participant
- 2010 Invited International Reviewer for Centre of Excellence Grants for the Australian Research Council
- 2010 Co-Mentor to a team of researchers for Department of Homeland Security funded Research Experience for those at Minority Serving Institutions
- 2010 Co-Organizer of the DIMACS Workshop on Modeling and Mitigation

of the Impacts of Extreme Weather Events to Human Health Risks

- 2009-2010 Organizer of the EENR seminar series
- 2009 Organizer of the DIMACS Workshop on Behavioral Epidemiology
- 2009 Co-Organizer DIMACS Workshop on Economic Epidemiology, Makerere Univ., Kampala, Uganda
- 2009 NSF grant reviewer/panel participant
- 2009 Co-Organizer/ Program Co-Chair Workshop on Economic Epidemiology, Makerere Univ., Kampala, Uganda
- 2009 Co-Organizer Mosquito Modeling Made Easy Day at Rutgers Univ. Center for Vector Biology
- 2009-2010 Member E&E Executive Committee
- 2008-cont. Member of EENR Curriculum Committee
- 2008-2010 Member Chief Editorial Committee for the DIMACS Book Series
- 2008-2010 Member Editorial Board of DIMACS Educational Modules Series
- 2008 Invited organizer SIAM mini-symposium on Network Models of Infectious Disease
- 2008 Ran the Reconnect Program on Biosurveillance at DIMACS – a week long short course for teaching faculty at liberal arts institutions on an advanced topic to expand their own and their students research opportunities
- 2007-2009 Member of the Rutgers University Advisory Board to the Office for the Promotion of Women in Science, Engineering and Mathematics
- 2007 Mentor to two teams of researchers for Department of Homeland Security funded Research Experience for those at Minority Serving Institutions
- 2006-cont. Advisory/Editorial Board Member for the journal *Annales Zoologici Fennici*
- 2006-cont. Research Advisor for Rutgers Univ. DIMACS REU
- 2006 Research Advisor for Tufts Univ. Summer Scholars Program
- 2005-2007 Co-organizer DIMACS seminar series Mathematical and Computational Epidemiology

- 2004-cont. Referee of papers for *Behavioral Ecology and Sociobiology*, *Mathematical Biosciences*, *Journal of Insect Science*, *Bulletin for Mathematical Biology*, *Annales Zoologici Fennici*, *Journal of Medical Internet Research*, *Journal of Biological Dynamics*, *Malaria Journal*, *PeerJ*, *PLoSOne*, *PloS Medicine*, *PNAS*, *Vaccine*, *Journal of Nonlinear Dynamics*, *Journal of the Royal Society Interface*, *American Naturalist*, *Canadian Biosystems Engineering*, *PLoS Computational Biology*, *Vector-Borne and Zoonotic Diseases*, *Biological Conservation*
- 2004 Subject Matter Expert on Innate Immunity and Biodefense, National Defense University
- 2004 Research Consultant, DARPA (via Strategic Analysis, INC.)
- 2003 Developed algorithm for Managing Endangered Species Habitat in Hawaii - MESH software package (Reed, J.M., N.H. Fefferman, C.S. Elphick, and M. Silbernagle. 2004)
- 2000-2002 Technical Editor (Cryptography) to MacMillan Press
- 1999 Invited Reviewer of AES submission to the National Institute of Standards and Technology, later published as The Twofish Encryption Algorithm, Schneier, et al, 1999, John Wiley & Sons Inc.