

DAVID E. HIEBELER

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RESEARCH

Mathematical population ecology and epidemiology; effects of spatially structured environmental heterogeneities on population dynamics, using computational and mathematical stochastic spatial models. Cellular automata and complex adaptive systems; agent-based models.

EDUCATION AND AWARDS

Cornell University, Ithaca, NY 1995 – 2000

PhD in Applied Mathematics, August 2001. Thesis title: *Populations and the Evolution of Dispersal on Spatially Structured Heterogeneous Landscapes*

US Environmental Protection Agency STAR graduate fellowship, 1997 – 2000

NSF training grant fellowship in “The Dynamics of Heterogeneous Ecological and Evolutionary Systems,” 1995 – 1997

Harvard University, Cambridge, MA 1993–1995

M.S. in Applied Mathematics, June 1995

Rensselaer Polytechnic Institute, Troy, NY 1986–1990

B.S. in Computer Science, magna cum laude, December 1990.

ACADEMIC POSITIONS HELD

Associate Professor

Fall 2008–present

Assistant Professor

Fall 2002–Fall 2008

Dept. of Mathematics and Statistics

University of Maine

- Courses taught: Intro. to Principles of Statistical Inference (MAT232), Linear Algebra (MAT262), Capstone Course in Math (MAT401), Differential Equations and Dynamical Systems (MAT451), Numerical Analysis (MAT487), and various topics courses (MAT400 and MAT500) including Modeling & Simulation, Complex Adaptive Systems, and Advanced Linear Algebra.

Cooperating Research Faculty

Spring 2008–present

School of Biology and Ecology

University of Maine

Adjunct Faculty

Summer 2008–present

Mathematical, Computational and Modeling Sciences Center

Arizona State University

Visiting Lecturer

Fall 2000–Spring 2002

Dept. of Biological Statistics and Computational Biology

Cornell University

GRANTS AND AWARDS

- NSF CAREER award DMS-0746603, “Dynamics of Hierarchical Household-Structured Epidemiological Models”, 9/1/2008 – 8/31/2013. \$400,000 (\$300K from NSF Division of Environmental Biology, and \$100K from Division of Mathematical Sciences).
- NSF research grant DMS-0718786, “Spatial Population Models in Spatiotemporally Correlated Environments”, 9/1/2007 – 8/31/2010. \$179,997, (\$120K from NSF Division of Mathematical Sciences, and \$60K from Division of Environmental Biology).
- IT Faculty Technology Stipend, “Bug-Sim: Foraging for Food in Spatially Structured Virtual Worlds,” Spring/Summer 2007. \$1250, UMaine Dept. of Information Technologies.
- Faculty Summer Research Fund award, “Pair Approximations of Biological Invasion Models on Clustered Heterogeneous Landscapes,” summer 2005. \$7500, UMaine Office of the Vice President for Research.
- IT Faculty Technology Stipend, “Development of a ‘Complex Systems’ Demonstration Simulation Suite,” Spring/Summer 2004. \$1250, UMaine Dept. of Information Technologies.
- Sea Grant, “An Agent-based Model of the Maine Lobster Fishery,” 2/1/04 – 1/31/07. Jim Wilson (PI), David Hiebeler (co-PI), Yong Chen (co-PI). \$93,000 Sea Grant Funds, plus other matching funds. 25% of credit for this grant is allocated to me.
- Learning Circles grant, “Beginning Development of a Demonstration Simulation Toolbox,” November 2003. PI: David Hiebeler (Math); co-PI’s: Larry Latour (Computer Science), Raymond O’Connor (Wildlife Ecology), Jim Wilson (Marine Sciences and Resource Economics), and Liying Yan (PhD student, Computer Science). \$500, UMaine Center for Teaching Excellence.

PUBLICATIONS AND PRESENTATIONS

Refereed articles

1. D.E. Hiebeler, “Implications of Creation,” *Idealistic Studies* **23(1)**, Winter 1993.
2. D.E.H., “Stochastic Spatial Models: From Simulations to Mean Field and Local Structure Approximations,” *Journal of Theoretical Biology* **187**, 307–319 (1997), and presented at the annual meeting of the Ecological Society of America, Providence RI, Aug. 1996.
3. D.E.H., “Populations on Fragmented Landscapes with Spatially Structured Heterogeneities: Landscape Generation and Local Dispersal,” *Ecology* **81(6)**, 1629–1641 (2000), and presented at the annual meeting of the Society for Mathematical Biology, Raleigh NC, Aug. 1997.
4. D.E.H., “Competition Between Near and Far Dispersers in Spatially Structured Habitats,” *Theoretical Population Biology*, **66(3)**, 205–218 (2004).
5. D.E.H., “Spatially Correlated Disturbances in a Locally Dispersing Population Model,” *Journal of Theoretical Biology*, **232(1)**, 143–149 (2005).
6. D.E.H., “A Cellular Automaton SIS Epidemiological Model with Spatially Clustered Recoveries,” presented at the workshop on Modelling of Complex Systems by Cellular Automata, at the *International Conference on Computational Science*, Atlanta, GA, May 2005. Also published in refereed conference proceedings in *Lecture Notes in Computer Science*, **3515**, 360–367 (2005).
7. D.E.H., “Dynamics and Resistance to Neighborhood Perturbations of Discrete- and Continuous-Time Cellular Automata,” *Journal of Cellular Automata*, **1(2)**, 125–139 (2006).
8. D.E.H., “Moment Equations and Dynamics of a Household SIS Epidemiological Model,” *Bulletin of Mathematical Biology*, **68(6)**, 1315–1333 (2006).
9. D.E.H. and Amanda K. Criner, “Partially Mixed Household Epidemiological Model with Clustered Resistant Individuals,” *Physical Review E*, **75**, 022901 (2007).

Refereed articles, continued

10. D.E.H., “Competing Populations on Fragmented Landscapes with Spatially Structured Heterogeneities: Improved Landscape Generation and Mixed Dispersal Strategies,” *Journal of Mathematical Biology*, **54(3)**, 337–356 (2007).
11. D.E.H. and Benjamin R. Morin, “The Effect of Static and Dynamic Spatially Structured Disturbances on a Locally Dispersing Population,” *Journal of Theoretical Biology*, **246(1)**, 136–144 (2007).
12. D.E.H., “Transient Dynamics and Quasistationary Equilibria of Continuous-time Linear Stochastic Cellular Automata Voter Models with Multiscale Neighborhoods,” *Advances in Complex Systems*, **10(suppl. 1)**, 145–165 (2007).

Other selected professional publications and presentations

1. D.E.H., “A Brief Overview of Cellular Automata Simulation Packages,” *Physica D* **45**, 1990.
2. D.E.H. and R.C. Tatar, “Cellular Automata and Discrete Physics,” published as chapter 12 of *Introduction to Nonlinear Physics*, edited by Lui Lam (Springer-Verlag, 1997), and presented at the *Winter School on Nonlinear Physics*, San Jose, CA, Jan. 1990.
3. D.E.H., “The Swarm Simulation System and Individual-Based Modeling,” presented at and published in the proceedings of *Decision Support 2001: Advanced Technology for Natural Resource Management*, Toronto, Sep. 1994. Also published as Santa Fe Institute working paper 94-12-065.
4. D.E.H., “Spatially Structured Discrete Population Models,” presented at the *International Conference on Mathematical Biology* held in Hangzhou, China, May 1997, and published in *Advanced Topics in Biomathematics*, edited by Lansun Chen, Shigui Ruan, and Jun Zhu (World Scientific, 1998).
5. D.E.H., “Dispersal on Structured Fragmented Landscapes,” poster presented at the *EPA STAR Graduate Fellowship Conference*, July 1999.
6. D.E.H., “Modeling Invasions Between Near and Far Dispersers on Structured Heterogeneous Landscapes,” presented at the *Beijing International Symposium on Biological Invasions*, Beijing, June 2004.
7. D.E.H. and Amanda Criner (undergraduate research assistant), “Household Epidemiological Models With Clustered Resistant Individuals,” poster presented at the joint Society for Industrial and Applied Mathematics / Society for Mathematical Biology (SIAM/SMB) Conference on the Life Sciences, Raleigh, NC, Jul. 31 – Aug. 4, 2006.
8. D.E.H., “What do Birds, Plants and Internet Worms have in Common? Mixed Dispersal on Clustered Heterogeneous Landscapes,” invited colloquium at the Colby College Mathematics Dept., March 2007.

Non-professional publications

1. D.E. Hiebeler, “The Little Monkey’s Adventure,” (fiction, in Chinese), published in Xiao Peng You magazine, Shanghai, China, Sep. 1996.
2. D.E. Hiebeler, “Why Did the Deer Stomp His Foot,” (nonfiction, in Chinese) published in Xiao Peng You magazine, Shanghai, China, June 1998.
3. Biweekly columnist for the Cornell Daily Sun newspaper, fall 1999.
4. D.E. Hiebeler, “Career Automata,” *Science’s Next Wave*, Feb. 6, 2004. Invited autobiographical article about the path leading to my research career.

Non-professional publications, continued

5. D.E. Hiebeler, “A Foreign Bigfoot Searches for Shoes,” (nonfiction, in Chinese with translation assistance from Yanlin Ding), in Xin¹ Min² Wan³ Bao⁴ (“Xinmin Evening News” newspaper), Shanghai, China, Oct. 29 2005.
6. D.E. Hiebeler, “Measure Maine’s Coast,” Letter to the Editor published in the *Bangor Daily News*, Friday June 2, 2006. Letter regarding fractal geometry.

SERVICE

- Manuscript referee for the following journals since Fall 2002:
American Naturalist (3), Annals of Applied Probability, Bulletin of Mathematical Biology, Communications in Nonlinear Science and Numerical Simulations, Ecological Modelling (4), Ecology Letters, Ecology, Ecosystems (3), Epidemiology and Infection, International Journal of Applied Mathematics and Statistics, Journal of Mathematical Biology, Journal of Mathematics and Culture, Journal of Theoretical Biology (6), Landscape Ecology, Physica A (2), Physics Letters A, Plant Ecology, SIAM Journal on Applied Dynamical Systems (2), Theoretical Population Biology (4)
- Grant proposal reviewer for the following agencies:
 - ◊Israel Science Foundation, May 2006
 - ◊National Science Foundation: ad hoc reviews in Sep 2006, Mar 2007, Feb 2008, Sep 2008
 - ◊National Science Foundation: review panel member in April 2008
- Invited member of the Scientific Committee for ACRI, the Seventh International Conference on Cellular Automata for Research and Industry (Perpignan, France, Sept 20-23, 2006).
- Research advisor and lecturer at the Mathematical and Theoretical Biology Institute (MTBI) at Arizona State University, summers of 2006, 2007, and 2008.
- Member of External Advisory Board for the Ecosystems Informatics IGERT program at Oregon State University, Fall 2006–Spring 2007.

STUDENT ADVISING

Advisor for the following graduate students:

- Ben Morin (M.A., Mathematics and Statistics), Fall 2004–Spring 2006.
- Andrew Johnson (M.S., Ecology and Environmental Science), Fall 2008–present.

Advisor for the following undergraduate honors projects:

Current:

- Isaac Michaud (Mathematics), Fall 2008–present.

Previous:

- Jennifer Houle (B.A., Mathematics and Statistics), Fall 2005–Spring 2006.

STUDENT ADVISING, CONTINUED

Member of the following graduate student committees:

Current:

- Andrew Paradis (PhD, Physics), Fall 2004–present.
- Thomas Stone (PhD, Physics), Spring 2008–present.

Previous:

- Medea Steinman (M.S., Wildlife Ecology), Fall 2003–Spring 2004.
- Debra Kenneway (M.S., Physics), Fall 2003–Fall 2004.
- Dianna Queheillalt (PhD, Wildlife Ecology), Fall 2003–Spring 2005.
- Fred Beaudry (PhD, Wildlife Ecology), Fall 2003–Fall 2007.
- Liying Yan (PhD, Interdisciplinary Program), Summer 2004–Spring 2007.
- Rodney Jacobs (M.S., Computer Science), Spring 2005–Fall 2005.
- David Patrick (PhD, Wildlife Ecology), Fall 2005–Spring 2007.
- Chenglu Dai (M.A., Mathematics and Statistics), Fall 2007–Summer 2008.

Member of the following undergraduate honors thesis committees:

Current:

- Chelsea Lucas (Ecology & Environmental Sciences), Spring 2008–present.

Previous:

- Roy Gott (Computer Science), Fall 2003–Spring 2004.
- David Gosselin (Computer Science), Fall 2006.
- Matt Dube (Mathematics), Fall 2006–Spring 2007.
- Benjamin Lakin (Mechanical Engineering), Fall 2006–Spring 2007.
- Jing Ling (Computer Engineering), Fall 2006–Spring 2007.
- Mark Larsen (Computer Science), Fall 2006–Fall 2007.
- Robert Lawlis (Mathematics), Spring 2008.

Research mentor on undergraduate research projects for the following additional students:

Current:

- Isaac Michaud (Mathematics), Fall 2007–present.
- Nick Millett (Mathematics), Fall 2007–present.

Previous:

- Sean Floyd (Mathematics), Spring 2003.
- Amanda Criner (Mathematics), Fall 2004–Fall 2006.
- David Gosselin (Computer Science), Fall 2005–Spring 2006.
- Ashley Coe (Wildlife Ecology), Fall 2007–Spring 2008.

OTHER TEACHING EXPERIENCE

Teaching Assistant

BIOGD481: Population Genetics

Fall 1999

Cornell University

Teaching Assistant

CS100b: Introduction to Computer Programming (in Java)

Fall 1997

Cornell University

Teaching Fellow

AM111: Introduction to Scientific Computing

Spring 1995

Harvard University

OTHER WORK EXPERIENCE

Research Assistant and Programmer Oct 1992–Sept 1993, summer 1994
Santa Fe Institute, Santa Fe, NM

- Designed and implemented the prototype Swarm simulation environment for agent-based modeling (see www.swarm.org).
- Worked with researchers and students using the Swarm system for conducting experiments in economic modeling, emergence of hierarchical structures in artificial chemistries, and social insect behavior.

Applications Engineer December 1990–October 1992
Thinking Machines Corp., Cambridge, MA

Programmer, Research Scientist and Co-founder March 1990–May 1990
Automatrix, Inc., Rexford, NY

- Wrote low-level software to control CAM-PC, a plug-in Cellular Automata Machine for PC's.
- Developed cellular automata applications for physical modeling and physics education.

Research Assistant and Programmer May 1989–August 1990
*Center for Nonlinear Studies, Theoretical Division, and Advanced Computing Lab
Los Alamos National Laboratory, Los Alamos, NM*

- Developed lattice-based modeling software on Connection Machine supercomputer.

Engineering Assistant and Programmer March 1989–May 1989
Sub-contracted to the General Electric R&D Center, Schenectady, NY

Unix Consultant September 1987–May 1989
Information Technology Services, RPI, Troy, NY

Research Assistant August 1987–December 1988
Computer Science Department, RPI, Troy, NY

COMPUTER SKILLS

Languages/software: C, Matlab, R, Perl, C++, Java, csh, LaTeX, HTML, PostScript.
Systems: Strong Linux skills, Solaris/SunOS/BSD Unix, X11, Microsoft Windows.

PROFESSIONAL MEMBERSHIPS

Ecological Society of America
Society for Mathematical Biology
Society for Industrial and Applied Mathematics

OTHER

Citizenship: USA by birth.
Languages: English, Mandarin Chinese (approximately fourth-year level, written and spoken).