CURRICULUM VITAE

Alan Hastings

Distinguished Professor
Department of Environmental Science & Policy,
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Education:

Ph. D. in Applied Mathematics with minors in Population Ecology and Population Genetics, Cornell University, 1977
M. S. in Applied Mathematics, Cornell University, 1975
B. S. in Mathematics, Cornell University, 1973

Employment:

2003- -- **Distinguished Professor, Department of Environmental Science & Policy**;
1992-1998--Chair, Department of Environmental Science & Policy;
1989- -- Professor, Department of Environmental Science & Policy;
1985-1989-- Professor, Department of Environmental Science & Policy and Department of Mathematics;
1983-1985-- Associate Professor, Department of Environmental Science & Policy and Department of Mathematics;
1982-1983--Associate Professor, Department of Mathematics;
1979-1982--Assistant Professor, Department of Mathematics;
University of California, Davis

1977-1979--Assistant Professor, Department of Pure and Applied Mathematics;
Washington State University

Honors and awards:

Faculty Research Lecturer, University of California, Davis (2006-7)
Robert H. MacArthur Award, Ecological Society of America (2006)
Fellow, American Academy of Arts & Sciences (Elected 2005)

Fellow, American Association for the Advancement of Science (Elected 2005)
NSF Predoctoral Fellowship 1974-1977
Ford Foundation Fellowship for Engineering Research Relevant to Society 1973-1974

Other experience:

2008- Member and Chair, NIMBioS (National Institute for Mathematical and Biological Synthesis) Advisory Board

2008- Member, NEON (National Ecological Observatory Network) Science Technology and Education Advisory Committee

2008 (June) Visiting Professor, EPFL, Lausanne, Switzerland

2005- Member, (acting chair 2006-2007), Mercer Award Committee, Ecological Society of America

2004-2008 Member, Science Advisory Board, National Center for Ecological Analysis and Synthesis

2003 – NSF panels

2002-2004 Council Delegate, AAAS

1998-1999, Vice President; 1999-2001, President, 2001-2002, Past President, Society for Mathematical Biology

2001 NSF Long Term Ecological Research 20 year Review Committee

2000- 2002 NSF Ecology Panel

1997- 2002 Director, Research Training Grant in Nonlinear Dynamics in Biology, University of California, Davis

August 1997; July 1999; April 2002, July 2003, May 2005 —Distinguished Visitor, NERC Centre for Population Biology, Silwood Park, Imperial College

1994-1995, Vice Chair; 1995-1996, Chair; Theoretical Ecology Section, Ecological Society of America

Jan. 1991-June 1993--Chair, California Coordinating Committee for Nonlinear Sciences (a UC wide research group)

Jan. - Mar. 1992, Acting Chair, Division of Environmental Studies, UC Davis

Editorial work:

2006 – present Theoretical Ecology, founding Editor in Chief

2006 – present Journal of Theoretical Biology, Editorial Board

2003- present Theoretical Ecology Series, Academic Press, founding Editor in Chief

2003-present Chaos and Complexity Letters, Editorial Board

1998-2003 Conservation Ecology, Editorial Board

1995-2008 Journal of Mathematical Biology, Co - Editor in Chief
1993-1995; 2008- Journal of Mathematical Biology, Editor
1990-2003 Theoretical Population Biology, Associate Editor
1989-present Mathematical Biosciences, Editorial Board
1996-2001 Oecologia, Associate Editor
1995-1997 Evolution, Associate Editor
1989-1992 Ecology and Ecological Monographs, Board of Editors

Invited presentations (1998-present):

Plenary Speaker, Workshop on Control in Chemical and Life Sciences, Lausanne, Switzerland (June, 2009)
Plenary Speaker, Mathematical Models of Collective Dynamics in Biology and Evolution, Leicester, England (May, 2009)
University of Chicago (April, 2009)
Duke University (April, 2009)
McGill University, Montreal, Canada (March, 2009)
University of Colorado, Boulder (September 2008)
University of Guelph (September 2008)
Cornell Probability Summer School (June 2008)
UniNet meeting on Networks, Paris, France (June 2008)
Dynamical Systems in Biology, New York University (April 2008)
Louis Thaler Lecture, Montpellier, France (November 2007)
Robert H. MacArthur opening scientific plenary lecture, Ecological Society of America Annual Meeting, San Jose, CA (August 2007)
Plenary Lecture; Society for Mathematical Biology Annual Meeting, San Jose, CA (July 2007)
Plenary Lecture, The 2nd International Symposium "Dynamical Systems Theory and Its Applications to Biology and Environmental Sciences" Shizuoka University of Hamamatsu, Japan (March 2007)
International Congress on Ecology Modeling, Ube, Japan, Keynote Lecture (August 2006)
Hoksai Lecture, 2nd International Workshop of Application of Chaos Theory and Nonlinear Dynamics on Agricultural and Ecological Systems Tokyo University of Agriculture and Technology College of Agriculture (March 2006)
Unity in Diversity (in honor of Margalef) Barcelona, Spain (Nov. 2005)

Estación Biológica de Doñana, CSIC,Sevilla,Spain (Nov. 2005)
Ecological Society of America, Annual Meeting, (August 2005)
Centre for Mathematical Biology, University of Bath (May 2005)
Ostrom Lectureship, Washington State University, (March 2005)
Keynote Speaker, The 1st International Workshop of Application of Chaos Theory and Nonlinear Dynamics on Agricultural and Ecological Systems Tokyo University of Agriculture and Technology College of Agriculture (Nov. 2004)
Dept. of Biology University of South Florida (October 2004)
Dept. Ecology and Evolutionary Biology Iowa State University (September 2004)
Ecological Society of America, Annual Meeting, (August 2004)
Society for Conservation Biology, Annual Meeting (July 2004)
International Food Web Conference, Giessen, Germany (November 2003)
Dept. Ecology, Evolution, and Marine Biology, UC Santa Barbara (October 2003)
SMB Annual Meeting, Dundee (August 2003)
Biocomplexity Series, Northwestern (May 2003)
Dept. of Ecology and Evolution, Cornell University (February 2003)
Symposium on Ecological Theory and Restoration, Ecology Society of America Annual Meeting, Tucson, Arizona (August 2002)
Symposium on Structured Population and Community Modeling and Ecotoxicology, Society for Mathematical Biology Annual Meeting Knoxville (July 2002)
Special Session on Mathematical Biology, American Mathematical Society Regional Meeting, Portland, Oregon (June 2002)
Conference on Distribution, Diversity, and Evolutionary Dynamics, University of Virginia, Charlottesville, VA (June 2002)
Oxford University, Centre for Mathematical Biology (April 2002)
Imperial College, Centre for Population Biology (April 2002)
Dept. of Zoology, University of British Columbia (March 2002)
Dept. of Biological Sciences, University of Alberta (March 2002)
Dept. of Ecology and Evolutionary Biology, UC Santa Cruz (January 2002)
Newton Institute, University of Cambridge (Dec. 2001)
SUNY Stonybrook Symposium Honoring James Rohlf (Nov. 2001)
Mathematical Biology Conference at Gulbenkian Institute, Lisbon, Portugal (Keynote speaker) (Oct. 2001)
Workshop on Marine Reserves, Woods Hole Oceanographic Institute, (Aug. 2001)
IEEE Summer School on Biocomplexity and Biological Signal Processing (June 2001) (Three Lectures)

Frontiers in Oceanography Series, Scripps Institute of Oceanography (May 2001)
Texas A & M University (May 2001)
1st Brazilian Symposium on Mathematical and Computational Biology, Rio de Janeiro, Keynote speaker (April 2001)
Claremont Math Colloquium (April 2001)
McGill University (Sept. 2000)
Princeton University (April 2000)
Workshop on Mathematical Biology, Oberwolfach, Germany (Oct. 1999)
University of Tennessee, (October 1999)
Centre for Population Biology, Silwood Park, Imperial College, Ascot, England (July 1999)
Centre for Mathematical Biology, Oxford University, Oxford, England (July 1999)
Society for Mathematical Biology/ESTMB Joint Meeting (July 1999)
NATO Summer School on Mathematical Problems Arising from Biology, Toronto (June 1999)
University of Turku, Turku, Finland (April 1999)
Workshop on Metapopulations, Tvarminne, Finland (April 1999)
Mathematics Department, Pomona College, Claremont, California (April 1999)
Western Society of Naturalists, San Diego (December 1998)
INTELCOL (International Ecology Congress) Florence, Italy (July 1998)
Workshop on Mathematical Population Biology, Gothenberg, Sweden (May 1998)
University of Arizona, Dept. of Ecology and Evolutionary Biology (April, 1998)

Teaching Interests

Population Ecology, Mathematical Methods in Population Biology, Theoretical Ecology

Graduate students trained:

Previous: Richard Gomulkiewicz, Kevin Higgins, Aaron Klebanoff, Chris Ray, Perry deValpine, Brad Crane, Katya Prince, Arthur Amezcua, James Umbanhowar, David Brown, Charlotte Lee, Chris Dugaw, Caz Taylor, Roy Wright, Matt Holland, Eli Goldwyn

Current: Julie Blackwood, Alex Perkins, Carl Boettiger, Yun Tao

Postdoctoral students trained:

Previous: Duncan Callaway, Kathleen Crowe, Kim Cuddington, Gordon Fox, Sergey Gavrilets, Wesley Godoy, Jessica Green, Richard Hall, A. Noble Hendrix, M.

Forrest Hill, Carole Hom, Gary Huxel, Aaron King, John Lambrinos, Urmila Malvadkar, Kevin McCann, Pablo Rosso, Maria Sanchez, Chris Wilmers, Lee Worden, Brett Melbourne, Derin Wysham

Current: Julie Kellner, Danielle Lyles, Steve Teo, Paul Williams, Matt Holland

Grant Support

Predator-Prey Systems and Evolution of Ecological Parameters, National Science Foundation (DEB-8002593) 6/1/80-11/30/83 $46,406

NSF-CBMS Regional Conference on Mathematical Ecology, National Science Foundation, MCS-8403557 3/85 $19,711

New Approaches to Multilocus Population Genetics, National Institutes of Health, 1 R01 GM32130 7/1/83 - 6/30/95 (from $30,000 to $80,000 per year)

Development of Paradigms for the Dynamics of Structured Populations, Department of Energy, DE-FG 7/89 - 6/93, $150,000

Physical Forcing of Spatially Distributed, Meroplanktonic Organisms, National Science Foundation, (co-pi, with L.W.Botsford, J.Quinn, M. Patterson and T. Powell) OCE-90-16721, 10/90-10/93 $200,000

Acquisition of Computer Graphics Instrumentation for Computational Biology, National Science Foundation (with Joel Keizer and Angela Cheer, co-pi), 10/92-9/94 $200,000

Effects of Climatic Changes on Ecological Communities in Fragmented Habitat, NIGEC, 7/1/95-6/30/99 $186,000

Hybrid Zones: Changing the Assumptions Underlying the Theories, National Science Foundation, 10/15/96-9/30/00 $114,000

Research Training Grant in Nonlinear Dynamics in Biology, National Science Foundation (PI, with Joel Keizer, Angela Cheer, and Maureen Stanton), 1/1/97-12/31/02 $1,861,000

Larval Dispersal and Marine Metapopulation Dynamics, National Science Foundation (co-pi, with Louis Botsford), 10/15/97-10/14/00 $300,000

Spatial Dynamics of an Outbreaking Insect Population, National Science Foundation (co-pi, with Susan Harrison) 7/1/96-6/30/00 $200,000

Integrating biological control in the integrated pest management program for *Spartina alterniflora* in Willapa Bay, National Sea Grant (with Miranda Wecker and Donald Strong) 10/1/99 – 9/30/01 $120,000

Quantitative Environmental Biology Workshop, Fall 2000. National Science Foundation (PI, with Peter Arzberger and Shandelle Henson) 8/1/00-12/31/02 $38,881

CoOP NE Pacific: The Role of Wind Driven Transport in Shelf Productivity, National Science Foundation (with Louis Botsford for Davis part) 1/1/00-12/31/04 $946,349

GLOBEC: Physical Influences on California Current Salmon, National Science Foundation (co-pi, with Louis Botsford) 10/1/00-9/30/05 $597,000

Biocomplexity: Dynamics of an Invasive Non-Native Species and its Biological, Physical, and Human Impacts: *Spartina alterniflora* on the Pacific Coast. National Science Foundation (PI, with David F. Layton, Donald R. Strong, Edwin D. Grosholz, Susan L. Ustin) 10/15/00-10/14/05 $3,799,621

Subcontract for Biocomplexity: Coupled natural and human dynamics in coral reef ecosystems: The effect of marine reserve network design and implementation on fisheries, biodiversity, and humans. National Science Foundation (Main award to American Museum of Natural History) 1/1/02-12/31/06 $199,998 (subcontract amount)

QEIB. Using Phase Dynamics and a Model Experimental System to Understand the Effects of Extrinsic Variability on Predator and Prey Metapopulations. National Science Foundation (co-pi, with Marcel Holyoak) 7/1/02 - 6/30/05 $274,708

QEIB. Theory and Experimentation with a Powerful Trophic Cascade: Nematodes, Rootfeeders, and Bush Lupine. National Science Foundation (co-pi, with Don Strong) 9/1/03-8/31/08 $495,000

Collaborative:MSPA-CSE: Analysis and Detection of Transient Dynamics in Ecological Systems. National Science Foundation (PI, with Anthony Ives, Univ. of Wisconsin; Kevin Gross; NC State Univ.) 9/15/04-9/14/07 $450,000 (Total award to all 3 campuses)

Subcontract for EPA STAR Grant: Connectivity in Marine Seascapes: Predicting ecological and socioeconomic costs of climate change in coral reef ecosystems 3/1/2005-2/29/2008. EPA (Main Award to RFF) $86,607.64 (subcontract amount)

QEIB: Stochastic Spatial Spread: Models and Experiments. National Science Foundation (PI, with Brett Melbourne) 07/01/05 – 06/30/08 $291,893

U.S.-GLOBEC NEP Phase IIIb-CGOA: Environmental influences on growth and survival of Southeast Alaska coho salmon in contrast with other Northeast Pacific regions (co-pi, with L W Botsford) 04/01/06-03/31/09 $290,424

Biological Dynamics at Intermediate Time Scales. National Science Foundation 9/1/08-8/30/11 (PI) $460,192

Collaborative Research: Comparative Analysis of Salmon and Cod Population Responses. National Science Foundation 9/1/08-8/30/11 (co-PI, with Louis Botsford) $267,466

Publications

1. **Hastings, A.** (1972). Eliminating viability differences in computing recombination percentages. Journal of Heredity, 63, 129-131.

2. **Hastings, A.**, & Rohlf, F. J. (1974). Gene flow: effect in stochastic models of differentiation. American Naturalist, 108, 701-705.

3. **Hastings, A.** (1977). Spatial heterogeneity and the stability of predator-prey systems. Theoretical Population Biology, 12, 37-48.

4. **Hastings, A.** (1977). Some models in population biology. Unpublished doctoral dissertation, Cornell University, Ithaca, New York.

5. **Hastings, A.** (1978). Global stability of two species systems. Journal of Mathematical Biology, 5, 399-403.

6. **Hastings, A.** (1978). Global stability of Lotka-Volteerra systems with diffusion. Journal of Mathematical Biology, 6, 163-168.

7. **Hastings, A.** (1978). Spatial heterogeneity and the stability of predator-prey systems: predator mediated coexistence. Theoretical Population Biology, 14:380-395.

8. **Hastings, A.** (1978). An evolutionary optimization principle. Journal of Theoretical Biology, 75, 514-525.

9. **Hastings, A.** (1978). Evolutionarily stable strategies and the evolution of life histories. I. Density dependent models. Journal of Theoretical Biology, 75, 527-536.

10. **Hastings, A.** (1979). Spatial heterogeneity and the stability of predator-prey systems: population cycles. in V. Lakshmikantham (ed.), Applied Nonlinear Analysis. (pp. 607-618). New York: Academic Press.

11. **Hastings, A.**, & Caswell, H. (1979). Role of environmental variability in the evolution of life history strategies. Proceedings of the National Academy of Sciences, USA, 76, 4700-4703.

12. Caswell, H., & **Hastings, A.** (1980). Fecundity, developmental time, and population growth rate: an analytical solution. Theoretical Population Biology, 17, 71-79.

13. **Hastings, A.** (1980). Population dynamics in patchy environments. in T. A. Burton (ed.), Modelling and Differential Equations in Biology. (pp. 217-223). : Marcel Dekker.

14. Wollkind, D. J., **Hastings, A.**, & Logan, J. A. (1980). Models involving differential and integral equations appropriate for describing a temperature dependent predator-prey mite ecosystem on apples. in T. A. Burton (ed.), Modelling and Differential Equations in Biology. (pp. 255-277). : Marcel Dekker.

15. **Hastings, A.** (1980). Disturbance,coexistence,history, and competition for space. Theoretical Population Biology, 18, 363-373.

16. Wollkind, D. J., **Hastings, A.**, & Logan, J. A. (1980). Functional response, numerical response, and stability in arthropod predator-prey ecosystems involving age structure. Researches on Population Ecology, 22, 323-338.

17. **Hastings, A.** (1981). Multiple limit cycles in predator- prey models. Journal of Mathematical Biology, 11, 51-63.

18. **Hastings, A.** (1981). Simultaneous stability of D=0 and D≠0 for multiplicative viabilities at two loci:an analytical study. Journal of Theoretical Biology, 89, 69-81.

19. **Hastings, A.**, Seradilla, J. M., & Ayala, F. J. (1981). Boundary layer model for the population dynamics of single species. Proceedings of the National Academy of Sciences, 78, 1972-1975.

20. **Hastings, A.** (1981). Disequilibrium,selection and recombination: limits in two-locus two-allele models. Genetics, 98, 659-668.

21. **Hastings, A.** (1981). Marginal underdominance at a stable equilibrium. Proceedings of the National Academy of Sciences, USA, 78, 6558-6559.

22. **Hastings, A.** (1981). Stable cycling in discrete time genetic models. Proceedings of the National Academy of Sciences, USA, 78, 7224-7225.

23. **Hastings, A.**, & Wollkind, D. (1982). Age structure in predator-prey systems I. A general model and a specific example. Theoretical Population Biology, 21, 44-56.

24. Wollkind, D., **Hastings, A.**, & Logan, J. (1982). Age structure in predator-prey systems II. Functional response and stability and the paradox of enrichment. Theoretical Population Biology, 21, 57-68.

25. **Hastings, A.** (1982). Unexpected behavior in two locus genetic models: an analysis of marginal underdominance. Genetics, 102, 129-138.

26. **Hastings, A.** (1982). Dynamics of a single species in a spatially varying

environment: The stabilizing role of high dispersal rates. Journal of Mathematical Biology, 16, 49-55.

27. **Hastings, A.** (1982). Small deviations from symmetry in models in population biology. in V. Lakshmikantham (ed.), Nonlinear Phenomena in Mathematical Sciences. (pp. 513-516). New York: Academic Press.

28. **Hastings, A.** (1983). Age dependent predation is not a simple process. I. Continuous time models. Theoretical Population Biology, 23, 347-362.

29. **Hastings, A.** (1983). Can spatial variation alone lead to selection for dispersal ? Theoretical Population Biology, 24, 244-251.

30. Levin, S. A., Cohen, D., & **Hastings, A.** (1984). Dispersal strategies in patchy environments. Theoretical Population Biology, 26, 165-191.

31. **Hastings, A.** (1984). Simple models for age dependent predation. S. A. Levin, & T. G. Hallam (eds.), Mathematical Ecology, Proceedings, Trieste 1982. (pp. 114-119). New York: Springer-Verlag.

32. **Hastings, A.** (1984). Evolution in a seasonal environment: simplicity lost ? Evolution, 38, 350-358.

33. **Hastings, A.** (1984). Linkage disequilibrium, selection and recombination at three loci. Genetics, 106, 153-164.

34. **Hastings, A.** (1984). Age dependent predation is not a simple process. II. Wolves, ungulates and a discrete time model for predation on juveniles with a stabilizing tail. Theoretical Population Biology, 26, 271-282.

35. **Hastings, A.** (1984). Maintenance of high disequilibrium in the presence of partial selfing. Proceedings National Academy of Sciences, USA, 81, 4596-4598.

36. **Hastings, A.** (1984). Delays in recruitment at different trophic levels effects on stability. Journal of Mathematical Biology, 21, 35-44.

37. **Hastings, A.** (1985). Stable equilibria at two loci in populations with large selfing rates. Genetics, 109, 215-228.

38. **Hastings, A.** (1985). Four simultaneously stable polymorphic equilibria in two-locus two-allele models. Genetics, 109, 255-261.

39. **Hastings, A.** (1985). Multilocus population genetics with weak epistasis. I. Equilibrium properties of two- locus two-allele models. Genetics, 109, 799-812.

40. **Hastings, A.** (1985). Evolution in the seasonal theta models. Evolution, 39, 709.

41. **Hastings, A.** (1986). Interacting age structured populations. in T. G. Hallam, & S. A. Levin (eds.), Mathematical Ecology. (pp. 287-294). New York: Springer-Verlag.

42. **Hastings, A.** (1986). Multilocus population genetics with weak epistasis. II. Equilibrium properties of multilocus models: What is the unit of selection ? Genetics, 112, 157-171.

43. **Hastings, A.** (1986). The invasion question. Journal of Theoretical Biology, 121, 211-220.

44. **Hastings, A.** (1986). Limits to the relationship among recombination, disequilibrium, and epistasis in two locus models. Genetics, 113, 177-185.

45. **Hastings, A.** (1987). Can competition be detected using species co-occurence data? Ecology, 68, 117-124.

46. **Hastings, A.** (1987). Cycles in cannibalistic egg-larval interactions. Journal of Mathematical Biology, 24, 651-666.

47. **Hastings, A.**, & Costantino, R. (1987). Cannibalistic egg-larval interactions in Tribolium: an explanation for the oscillations in population numbers. The American Naturalist, 113, 36-52.

48. **Hastings, A.** (1987). Substitutions under stabilizing selection. Genetics, 116, 479-486.

49. Quinn, J. F., & **Hastings, A.** (1987). Extinction in subdivided habitats. Conservation Biology, 1, 198-208.

50. **Hastings, A.** (1987). Monotonic change of the mean phenotype in two locus models. Genetics, 117, 583-585.

51. **Hastings, A.** (1988). Disequilibrium in two-locus mutation-selection models. Genetics, 118, 543-547.

52. **Hastings, A.** (1988). Dependence of expected heterozygosity on locus number with stabilizing selection and drift. Journal of Theoretical Biology, 134, 103-112.

53. **Hastings, A.** (1988). Food web theory and stability. Ecology, 69, 1665-1668.

54. Quinn, J. F., & **Hastings, A.** (1988). Extinction in subdivided habitats: Reply to Gilpin. Conservation Biology, 2, 293-296.

55. **Hastings, A.** (ed.). (1988). Community Ecology. New York: Springer-Verlag.

56. **Hastings, A.** (1988). When should you include age structure? in A. Hastings (ed.), Community Ecology. (pp. 25-34). New York: Springer-Verlaag.

57. **Hastings, A.** (1989). Linkage disequilibrium and genetic variances under mutation-selection balance. Genetics, 121, 857-860.

58. **Hastings, A.**, & Hom, C. L. (1989). Pleiotropic stabilizing selection limits the number of polymorphic loci to at most the number of characters. Genetics, 122, 459-463.

59. **Hastings, A.**, & Wolin, C. L. (1989). Within patch dynamics in a metapopulation. Ecology, 70, 1261-1266.

60. **Hastings, A.** (ed.). (1989). Some Mathematical Questions in Biology: Models in Population Biology. Lectures on Mathematics in the Life Sciences, Volume 20. Providence, Rhode Island: American Mathematical Society.

61. **Hastings, A.** (1989). Deterministic multilocus population genetics: an overview. in A. Hastings (ed.), Some Mathematical Questions in Biology: Models in Population Biology. Lectures on Mathematics in the Life Sciences. Vol. 20. (pp. 27-54). Providence, Rhode Island: American Mathematical Society.

62. **Hastings, A.** (1990). The interaction between selection and linkage in plant populations. in A. H. D. Brown, M. T. Clegg, A. Kahler, & B. Weir ((eds.).), Population Genetics, Plant Breeding and Gene Conservation. (pp. 163-180). Sunderland, MA: Sinauer Associates, Inc.

63. **Hastings, A.** (1990). Maintenance of polygenic variation through mutation-selection balance: bifurcation analysis of a biallelic model. J. Math. Biol., 28, 329-340.

64. Gomulkiewicz, R. S., & **Hastings, A.** (1990). Ploidy and evolution by sexual selection: a comparison of haploid and diploid female choice models near fixation equilibria. Evolution, 44, 757-770.

65. **Hastings, A.**, & Hom, C. L. (1990). Multiple equilibria and maintenance of additive genetic variance in a model of pleiotropy. Evolution, 44, 1153-1163.

66. **Hastings, A.** (1990). Second-order approximations for selection coefficients at polygenic loci. J. Math. Biol., 28, 475-483.

67. **Hastings, A.** (1990). Spatial heterogeneity and ecological models. Ecology, 71, 426-428.

68. **Hastings, A.** (1991). Structured models of metapopulation dynamics. Biological Journal of the Linnean Society, 42, 57-71.

69. **Hastings, A.**, & Costantino, R. F. (1991). Oscillations in population numbers: Age dependent cannibalism. Journal of Animal Ecology, 60, 471-482.

70. **Hastings, A.**, & Powell, T. (1991). Chaos in a three species food chain. Ecology, 72, 896-903.

71. Klebanoff, A., Minta, S., **Hastings, A.**, & Clark, T. (1991). Age-dependent predation model of black-footed ferrets and prairie dogs. SIAM Journal on Applied Mathematics, 51, 1053-1073.

72. **Hastings, A.** (1991). McKendrick-Von Foerster Models for Patch Dynamics. in Lecture Notes in Biomathematics,

73. **Hastings, A.** (1992). Second-order approximations for selection coefficients at polygenic loci. 2. Pleiotropy. Journal of Mathematical Biology, 30,379-388

74. **Hastings, A.** (1992). Age dependent dispersal is not a simple process: density dependence, stability and chaos. Theoretical Population Biology, 41, 388-400.

75. Fox, G.A. & **Hastings, A.** (1992) Inferring selective history from multilocus frequency data -- Wright meets the Hamiltonian. Genetics. 132, 277-288.

76. **Hastings, A.** (1993) Complex interactions between dispersal and dynamics: Lessons from coupled logistic equations. Ecology.74, 1362-1372.

77. Gavrilets, S. & **Hastings, A.** (1993). Maintenance of genetic variability under strong stabilizing selection: a two-locus model. Genetics, 134, 377-386.

78. **Hastings, A.**, Hom, C., Ellner, S., Turchin, P., & Godfray, H.C.J. (1993) Chaos in ecology: Is mother nature a strange attractor? Annual Reviews of Ecology and Systematics, 24, 1-33.

79. Klebanoff, A. & **Hastings, A.** (1994). Chaos in three species food chains. Journal of Mathematical Biology 32:427-451

80. **Hastings, A.** (1994) Conservation and spatial structure: Theoretical approaches. pp. 494-503 in Lecture Notes in Biomathematics. v. 100.

81. Gavrilets, S. & **Hastings, A.** (1994) Maintenance of multilocus variability under strong stabilizing selection. Journal of Mathematical Biology, 32, 287-302.

82. Botsford, L.W., C.L. Moloney, **A. Hastings**, J.L. Largier, T.M. Powell, K.Higgins, and J.F. Quinn. (1994). The influence of spatially and temporally varying oceanographic conditions on meroplanktonic larvae. Deep-Sea Research Part II - Topical Studies in Oceanography , 41:107-145

83. Klebanoff, A. & **Hastings, A.** (1994) Chaos in one-predator, two-prey models: general results from bifurcation theory. Mathematical Biosciences, 122:221-233

84. **Hastings, A.** & Higgins, K. (1994) Persistence of transients in spatially structured

ecological models, Science,263, 1133-1136.

85. Gavrilets, S. & **Hastings, A.** (1994) A quantitative genetic model for developmental noise Evolution 48:1478-1486.

86. Gavrilets, S. & **Hastings, A.** (1994) Dynamics of genetic variability in two-locus models of stabilizing selection. Genetics, 138:519-532.

87. **Hastings, A.** & Harrison, S. (1994). Metapopulation dynamics and genetics. Ann. Rev. Ecol. Syst. 25:167-188.

88. Gavrilets, S. and **Hastings, A.** (1995) Dynamics of polygenic variability under stabilizing selection, recombination, and drift. Genetical Research, 65:63-74

89. **Hastings, A.** & Fox, G.A. (1995) Optimization as a technique for studying population genetics equations. pp. 18-26 in Lecture Notes in Computer Science vol. 899

90. Ewens, W.J. & **Hastings, A.** (1995) Aspects of optimality behavior in population genetics equations. pp. 7-18 in Lecture Notes in Computer Science vol. 899

91. **Hastings, A.** (1995) A metapopulation model with population jumps of varying sizes. Math. Biosci. 128:285-298

92. Gavrilets, S., & **Hastings, A.** (1995) Intermittency and transient chaos from simple frequency-dependent selection. Proceedings Royal Society: Biological Sciences 261:233-238

93. **Hastings, A.** (1996) What equilibrium behavior of Lotka-Volterra models does not tell us about food webs. pp. 211-217 in Polis, G.A. and Winemiller, K.O. (eds.) Food Webs: Integration of Patterns & Dynamics Chapman & Hall, New York

94. **Hastings, A.** (1996) Models of spatial spread: is the theory complete? Ecology 77:1675-1679

95. Gavrilets, S., & **Hastings, A.** (1996) Founder effect speciation: a theoretical reassessment. American Naturalist 147:466-491

96. Harrison, S. & **Hastings, A.** (1996) Genetic and evolutionary consequences of metapopulation structure. Trends in Ecology and Evolution 11:180-183

97. Ray, C. & **Hastings, A.** (1996) Density dependence: are we searching at the wrong spatial scale? J. Animal Ecology 65:556-566

98. **Hastings, A.** (1996) Models of spatial spread: A synthesis. Biological Conservation 78:143-148

99. Gyllenberg, M., Hanski, I & **Hastings, A.** (1997) Structured metapopulation models. pp. 93-122 in Hanski, I. and Gilpin, M., eds. Metapopulation Biology. Academic Press, San Diego.

100. **Hastings, A.** (1997) Population Biology: Concepts and Models. Springer-Verlag, New York

101. Higgins, K., **Hastings, A.**, & Botsford, L. (1997) Density dependence and age structure: a general nonlinear study American Naturalist 149:247-269

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