

CURRICULUM VITAE

• **Personal Details**

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Center for Computational Genetics and Biological Modeling,  
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• **Education**

1994 Ph.D. – Biological Sciences, Stanford University.  
Title of thesis: Evolutionary Models for Recombination and Learning:  
Analytical and Computational Approaches.  
Name of advisor: Prof. Marcus W. Feldman .  
1990 M.Sc. – Biological Sciences, Stanford University.  
1976: Weitzman Institute, Rehovot, Israel, Physics.  
1972-1975: The Technion, Haifa, Israel, Physics.

• **Employment History**

July 2000 -: Senior Scientist, Founder and Director, Center for Integrative Research in Science and the Humanities, Stanford University.  
July 1997 – September 2003: Senior Scientist, Founder and Co-Director, Center for Computational Genetics and Biological Modeling, Stanford University.  
Aug 1992- June 1997: Founding Member, Group Leader, Evolutionary Biology and Adaptive Algorithms, Interval Research Corporation (Palo Alto, CA)  
1995-1996: Consulting Professor, Department of Biological Sciences, Stanford University (Stanford, CA).  
1996-1997: Visiting Scholar, Department of Biological Sciences, Stanford University (Stanford, CA).  
Feb 1985 - July 1992: Research Physicist, Robotics Lab. and Artificial Intelligence Center, SRI International (formerly Stanford Research Institute) (Menlo Park, CA).  
1986-1989: Visiting Scholar, Department of Biological Sciences, Stanford University (Stanford, CA).  
1982-1985: Group Leader, Image Processing, Elco Robotics (Ramat-Gan, Israel).  
1979-1982: Group Leader, Medical Information Analysis, M.G. Electronics (Rehovot, Israel).

• **Professional Activities**

(a) Positions in academic administration

July 2000 -: Director, Center for Integrative Research in Science and the Humanities, Stanford University.

July 1997- September 2003: Co-Director, Center for Computational Genetics and Biological Modeling, (School of Humanities and Sciences, School of Engineering, and School of Medicine) Stanford University.

(b) Professional functions outside universities/institutions

2000-**Associate Editor, *ComplexUs***: Modeling and Understanding Functional Interaction in Life Sciences and Systems Biology.

1993 Committee and organizing committee IEEE international conference on neural network and fuzzy logic. Chairman of the video proceedings and session on evolution and computational paradigms. San Francisco, CA.

1987-now Member, Santa Fe Institute, Santa Fe, NM.

1998-2003 Member, board of directors – Mid-Peninsula Jewish Community Day School, Palo Alto, CA.

2000-Now Member, Scientific Advisory Board, Equator Technologies Inc., Campbell CA

2002-Now Member, Advisory Board, Santiago Ventures, Atherton, CA

(c) Significant professional consulting

1998 – 2000 Interval Research – Dynamical Algorithm design

2000 – 2001 Magnolia Broadband – Adaptive Algorithm design

(d) Membership in professional/scientific societies

1985- AAAS, American Association for the Advancement of Science.

1986- BBS, Behavioral and Brain Sciences.

1986- IEEE, Institute of Electrical and Electronics Engineers.

1989- American Society of Naturalists.

1989- American Society of Genetics.

1990- The Society for the Study of Evolution.

1990- Society of Molecular Biology and Evolution.

• Courses taught

- Theoretical Population Genetics, Graduate Seminar, Stanford University
- Bio-Statistics –Core biology course, Stanford University
- Developmental Biology, upper level course, Stanford University
- Complex Systems Summer School, Santa Fe Institute
- Science and Religion, cross-listed between Human Biology and Religious Studies, Stanford University.

• **Awards, Citations, Honors, Fellowships**

1994: Stanford University: Samuel Karlin Prize in Mathematical Evolutionary Theory.

• **Scientific Publications**

1. Mark Siegal and Aviv Bergman 2004, "Canalization" in "Evolutionary Genetics: Concepts and Case Studies", Charles Fox and Jason Wolf Eds. (to appear).
2. Aviv Bergman and Mark L. Siegal 2003, "Evolutionary Capacitance as a General Feature of Complex Gene Networks", *Nature* **424**, 549-552.
3. Joanna Masel and Aviv Bergman, 2003, "The Evolution of the Evolvability Properties of the Yeast Prion [PSI+]", *Evolution* **57**(7) 1498-1512.
4. Henrique Pereira, Aviv Bergman and Joan Roughgarden, 2003 "A Theory of Territoriality for Sit-and-Wait Predator", *American Naturalist* **161**(1):143-152.
5. Aviv Bergman and M. W. Feldman. 2003. "On the Population Genetics of Punctuation" in "Evolutionary Dynamics-Exploring the Interplay of Selection, Accident, Neutrality, and Function" Jim Crutchfield, and Peter Schuster Eds. Pp 81-100 Oxford University Press.
6. Aviv Bergman and Moshe Tenenholz 2003. "Episodic Learning: Towards the Emergence of Partial Cooperation." (*ComplexUs*, in press).
7. Mark Siegal and Aviv Bergman 2002, "Waddington's Canalization Revisited: Developmental Stability and Evolution" *Proceedings of the National Academy of Sciences USA* Vol. **99** No. 16 10528-10532.
8. Samuel Karlin, Luciano Brocchieri, Aviv Bergman, Jan Mrzek and Andrew J. Gentles, 2002, "Amino Acid and Charge Runs in Complete Eukaryotic Genomes and Disease Associations", *Proceedings of the National Academy of Sciences USA* vol. **99** No. 1 333-338.
9. Aviv Bergman and Moshe Tenenholz 2002. "On the Natural Selection of Market Choice." *Autonomous Agents and Multi-Agent Systems* **5**(4): 387-395.
10. Samuel Karlin, Aviv Bergman and Andrew Gentles 2001, "Annotation of the Drosophila genome" *Nature* **411**, 259-260.
11. David B. Goldstein, G. W. Roemer, D. A. Smith, A. Bergman, and R. K. Wayne 1999. "The use of microsatellite variation to infer population structure and demographic history in a natural model system." *Genetics* **151**: 797-801.
12. Benjamin Kerr, D. W. Schwilk, A. Bergman, and M. W. Feldman 1999. "Rekindling an old flame: A haploid model for the evolution and impact of flammability in re-sprouting plants." *Evolutionary Ecology Research*. **1**: 807-833
13. David D. Pollock, A. Bergman and M. W. Feldman and D. B. Goldstein. 1998. "Microsatellite behavior with range constraints: Parameter estimation and improved distance estimation." *Theoretical Population Biology* **53**:256-271.
14. Ilan Eshel, M. W. Feldman, and A. Bergman. 1998. "Long-term evolution, short-term evolution, and population genetics theory." *J. Theor. Biol.* **191**:391-396.
15. Freddy B. Christiansen, S. P. Otto, M. W. Feldman and A. Bergman. 1998. "Waiting with and without recombination: The time to production of a double mutant." *Theoretical Population Biology* **53**: 199-215.
16. Marcus W. Feldman, A. Bergman, D.D. Pollock and D. B. Goldstein. 1997. "Microsatellite genetic distances with range constraints: Analytic description and problems of estimation." *Genetics* **145**: 207-216.
17. Lev A. Zhivotovsky, M. W. Feldman and A. Bergman. 1996. "Fitness patterns and phenotypic plasticity in a spatially heterogeneous environment." *Genetical Research* **68**: 241-248.

18. Lev A. Zhivotovsky, M. W. Feldman and A. Bergman. 1996. "On the evolution of phenotypic plasticity in spatially heterogeneous environment." *Evolution* **50**:547-558.
19. Aviv Bergman and M.W. Feldman 1995. "On the evolution of learning: representation of a stochastic environment", *Theoretical Population Biology* **48**:251-276.
20. Aviv Bergman, S. P. Otto and M. W. Feldman. 1995. "On the Evolution of recombination in haploids and diploids. II. Stochastic models." *Complexity* **2**:49-57.
21. Aviv Bergman, S. P. Otto and M. W. Feldman. 1995. "On the Evolution of recombination in haploids and diploids. I. Deterministic models." *Complexity* **1**:57-67.
22. Aviv Bergman, D. B. Goldstein, M. W. Feldman and K. E. Holsinger. 1995. "Population structure, fitness surfaces, and linkage in the shifting balance process." *Genetical Research* **66**:85-92.
23. David B. Goldstein, A. Bergman and M. W. Feldman. 1993. "The evolution of interference: Reduction of recombination among three loci." *Theoretical Population Biology* **44**:246-259.
24. Aviv Bergman and M. W. Feldman 1992. "Recombination dynamics and the fitness landscape" *Physica D* **56**:57-67.
25. Aviv Bergman and M. W. Feldman. 1990. "More on selection for and against recombination" *Theoretical Population Biology* **38**:68-92.
26. Maciej, F. Boni and A. Bergman. 2002. "Co-infectious micro-parasites in an invertebrate host population: A dynamics systems approach." *CCGBM Working Paper*.
27. Aviv Bergman, Tom Wasow, Amy Perfors, Thorsten Brants, and David Beaver, 2002, "Why Dose Ambiguity Exists?" *Semfest 2002 Stanford University*
28. Dan Cohen, and, A. Bergman 1998. "Evolutionary aspects of learning: the interface between fitness and action." *Proceedings of the 7th International Behavioral Ecology Congress*.
29. Lev A. Zhivotovsky, A. Bergman and M. W. Feldman. 1996. "A Model of Individual Adaptive Behavior in a Fluctuating Environment." in: *Adaptive Individuals in Evolving Populations: Models and Algorithms*, R. Belew and. M Mitchel Eds. Pp 131-153: Addison Wesley Publishing Company, Reading MA.
30. Jonathan Roughgarden, A. Bergman, S. Shafir, and C. Taylor. 1996 "Adaptive Computation in Ecology and Evolution: A Guide to Future Research". In *Adaptive Individuals in Evolving Populations: Models and Algorithms* Eds. Richard K. Belew and Melanie Mitchell. *Proceedings Volume XXVI Santa Fe Institute*.
31. Aviv Bergman and M. W. Feldman. 1996. "Question marks about the period of punctuation." (Santa Fe Institute (SFI) working paper 96-02-006).
32. Aviv Bergman. 1994. "An evolutionary approach to designing neural networks." in: *Computing with Biological Metaphors*, Ray Paton Ed., pp 298-308: Oxford press.
33. Aviv Bergman, P. Grassberger and T. P. Meyer. 1992. "Forecasting probabilities with neural networks", in: *Nonlinear Modeling and Forecasting, SFI Studies in the Sciences of Complexity, Proc. Vol. XII*, M. Casdagli and S. Eubank Eds. Pp 305-315: Addison-Wesley.
34. Aviv Bergman. 1992. "Predicting chaos", in: *Information Processing and Management of Uncertainty*.
35. Steve Barnard and A. Bergman. 1991. "Adaptation in signal spaces." in: *Parallel Problem Solving from Nature*, H. P. Schwefel and R. Manner Eds. pp 395-404: Springer-Verlag.
36. Eve Zuebisch and A. Bergman. 1990. "Designer network: An attack on the force-field parameter estimation problem." *American Chemical Society meeting San Francisco*.

37. Cregg, K. Cowan, A. Bergman and D. Nitzan. 1990. "Automatic placement of vision sensors." Proc. of 16th NSF Grantees Conference on Production Research and Technology, Arizona State University.
38. Aviv Bergman. 1990. "Self-organization by simulated evolution" in: Lectures in the Sciences of Complexity, Erica Jen Ed., pp 455-463: Addison Wesley Publishing Company.
39. Aviv Bergman and C. K. Cowan. 1989. "Determining the camera and light source location for a visual task." International Conference on Robotics and Automation, IEEE.
40. Cregg, K. Cowan, A. Bergman and D. Nitzan. 1989. "Automatic placement of vision sensors." Proc. of 15th NSF Grantees Conference on Production Research and Technology, University of California, Berkeley.
41. Aviv Bergman. 1988 "Variation and selection: An evolutionary model of learning in neural networks." International Neural Network Society First Annual Meeting, Boston.
42. Aviv Bergman, E. Bracha, P. G. Mulgaonkar and T. Shaham. 1988. "Advanced research in address block location." Proc. of USPS Third Advanced Technology Conference, pp 218-232, Washington, D.C.
43. Michel Kerszberg and A. Bergman. 1988. "The evolution of data processing abilities in competing automata." in Computer Simulation in Brain Science, Ed. Rodney M.J.Cotterill, pp 249-259: Cambridge University Press.
44. Aviv Bergman and P. G. Mulgaonkar. 1988. "Neural networks for address-block ranking: A comparison with classical techniques." Proc. of USPS Third Advanced Technology Conference, pp 736-750, Washington, D.C.
45. Aviv Bergman and M. Kerszberg. 1987. "Breeding intelligent automata." IEEE First Annual Conference on Neural Networks, Vol II pp 63-70, San Diego.
46. Michel Kerszberg and A. Bergman. 1986. "The evolution of computational capabilities in population of competing automata." STATPHYS-16 the 16th International Conference of Thermodynamics and Statistical Mechanics, Boston.
47. Aviv Bergman and P. G. Mulgaonkar. 1986. "Address block location: The SRI approach." USPS Advanced Technology Conference, pp 161-178, Washington, D.C.
48. Cregg, K. Cowan and A. Bergman. 1986. "Noise-tolerant range analysis for autonomous navigation." AAAI-86 Fifth National Conference on AI, pp 1122-1126, Philadelphia.

#### **Published scientific reports and technical papers**

49. Aviv Bergman and S. Barnard. 1992. "A model of vestibular adaptation." SRI International Report ECI 89-634.
50. Aviv Bergman. 1992. "Neural network development methodology: Application to computational chemistry." SRI International Technical Memorandum 223.
51. Aviv Bergman. 1991. "Neural network development methodology." SRI International Technical Memorandum 217.
52. Aviv Bergman and S. Barnard. 1991. "An evolutionary approach to designing neural networks." AFOSR Contract No. F49620-89-K-0005 Final Report.
53. Aviv Bergman. 1990. "Study of neural networks for computer system applications." SRI International Technical Memorandum 205.
54. Cregg, K. Cowan, A. Bergman and J. K. Myers. 1989 "Robotics support for the AVTB" Final Report, SRI International Project 7390.

55. Aviv Bergman. 1989. "Neural networks classification." SRI Technical Memorandum 199.
56. Cregg, K. Cowan, A. Bergman and D. Nitzan. 1988. "Automatic placement of vision sensors." Robotics Laboratory Technical Report, SRI International Project 6054.
57. Prasanna G. Mulgaonkar, A. Bergman and T. Shaham. 1987. "Advanced research in address-block location." USPS Final Report SRI International Project 1477.
58. Aviv Bergman, P. G. Mulgaonkar and T. Shaham. 1987. "Advanced research in address-block location." USPS Interim Report No. 2 SRI International Project 1477.
59. Aviv Bergman, P. G. Mulgaonkar, J. Kramer and Z. Shmueli. 1986. "Advanced research in address-block location", USPS Interim Report No. 1 SRI Project 1477.
60. Aviv Bergman and R. C. Smith. 1986. "Estimating object location in manipulator's hand using force/torque information." SRI International Robotics Lab. Technical Note.
61. Randall C. Smith, A. Bergman, P. Cheeseman, J. K. Myers, D. Nitzan, A. J. Sword and E. Zeiler. 1986. "Development system for flexible assembly system." AFOSR Contract, SRI International Project 7239 Final Report

#### **Authored books**

1. Aviv Bergman. May 1994. "Evolutionary Models for Recombination and Learning: Analytical and Computational Approaches." A dissertation submitted to the biological sciences and the committee on graduate studies of Stanford University. (102 pages)

#### **Books and articles to be published (in preparation)**

1. Aviv Bergman and M. Kerszberg. "Exact genetic redundancy is either deleterious or quickly evolves into novel pathways."
2. Aviv Bergman, and Greg Gibson. "Three-Locus Model of Canalization."
3. Dan Cohen, and A. Bergman. "The Evolution of Adaptive Responses and Learning: General Introduction to Utility Functions in Adaptive Responses and Learning."
4. Aviv Bergman, and D. Cohen. "Optimal Utility Function."
5. Dan Cohen, and A. Bergman. "The Evolution of Adaptive Responses and Learning: Compact Representation of Resource Diversity by Fitness Correlated Utility Function, Individual Learning and Evolutionary Significance."
6. Aviv Bergman. "On the Evolution of Memory: Coordination and Sub-Coordination Games."
7. Aviv Bergman, and I. Eshel. "Anomalous properties of long term evolution."

**Lectures and Presentations at Meetings and Invited Seminars not Followed by Published Proceedings**

(a) Invited plenary lectures at conferences/meetings (*PARTIAL LIST*)

1. 2003 Invited talk "Evolutionary Causes and Consequences of Canalization", Collectives and the Design of Complex Systems, Stanford CA.
2. 2002 Plenary talk "Gould's punctuation versus Waddington's canalization: A look at micro and macro evolutionary processes" Bioinformatics in Biology Education, Sunnyvale, CA
3. 2002 "Micro-Macro Evolution" NASA Ames Workshop on Complex Systems
4. 2000 "Long-term short-term punctuation", Xerox PARC Forum.
5. 1999 "Phenotypic stability at the presence of genotypic variation", workshop on The Origins of Multi-cellularity -- Institute for Advanced Study, Budapest
6. 1989 Neural Networks and Evolution. Artificial Intelligence Forum, IEEE Computer Society Palo Alto, CA.
7. 1989 Neural network symposium. Alaiet Computers, Hyatt Regency, Burlingham, CA.
8. 1998 "Population genetics and the shifting balance process", workshop on the interface between biology and economics. Pennsylvania State University, Pennsylvania.
9. 1994 "On the evolution of learning". Scandinavian Association of Genetics. Aarhus, Denmark.
10. 1992 "Neural networks and chaotic dynamics". SFI, Adaptive Computation Founding Workshop, Santa Fe, NM.
11. 1992 "Evolution as a computational process". Bio-Computation workshop, Monterey, CA.

(b) Presentation of papers at conferences/meetings (*PARTIAL LIST*)

1. 2002, Joanna Masel and Aviv Bergman, Can Natural Selection Favor Evolvability? An Example with Yeast Prion, Evolution Meeting, Urbana-Champaign, IL.
2. 2002, Mark Siegal and Aviv Bergman, Evolution of Canalization: Evolution in light of Development, Gordon Conference on Theoretical Biology and Bioinformatics, Tilton, NH.
3. Ben-Ari G., Atzmon G., White K.P., Einat M., Lavi U., Blum S., Cahaner A., David L., Bergman A., Feldman M.W. and Hillel J. 2001. "Application of DNA Microarrays for Identification of Genes Controlling Fatness in Broiler Chickens"
4. 1995 Aviv Bergman and Marcus W. Feldman, Punctuation and stasis periods in evolutionary trajectories. SFI workshop on evolution on rugged landscape. Santa Fe, NM.
5. 1994 Aviv Bergman, Review of work in population genetics on recombination, SFI workshop on the foundations of Genetic Algorithms. Santa Fe, NM.
6. 1993 Aviv Bergman and Marcus W. Feldman, On the evolution of recombination, Santa Fe Institute, Santa Fe, NM.
7. 1993 Aviv Bergman and Marcus W. Feldman, on the evolution of learning. SFI workshop on the evolution of learning. Santa Fe, NM.
8. 1992 Aviv Bergman, Predicting chaos. Stanford Computer Science Dept., Stanford, CA.

9. 1991 Aviv Bergman, Simplicity and controlled variability. SFI, Santa Fe, NM.
10. 1991 Aviv Bergman and Marcus W. Feldman, Recombination dynamics and the fitness landscape. SFI, Santa Fe, NM.
11. 1991 Aviv Bergman Neural networks for prediction. SFI, Santa Fe, NM.
12. 1990 Aviv Bergman, Institute for Scientific Interchange (ISI), Torino Italy, Workshop on Evolution and Complexity.
13. 1989 Aviv Bergman, Learning through evolutionary processes. Lawrence Livermore National Laboratory, Livermore, CA.
14. 1989 Aviv Bergman, Population dynamics in neural networks. SFI complex systems summer school, Santa Fe, NM.

(c) Presentations at informal international seminars and workshops

1980-now, numerous presentation throughout the world (I kept no record).

(d) Seminar presentations at universities and institutions

1980-now, numerous presentation throughout the world (I kept no record).

• **Patents**

1. 2003 Michael Naimark, Aviv Bergman, Emily Weil Ignazio Moresco, and Boldo Faita, "Quantifying the level of interest on an item of current interest". United States Patent No. 6,556,989.
2. 2000 Michael Naimark, Aviv Bergman, Emily Weil Ignazio Moresco, and Boldo Faita, "Normalizing a measure of the level if current interest of an item accessible via a network". United States Patent No. INT1P210.
3. 2000 Michael Naimark, Aviv Bergman, Emily Weil Ignazio Moresco, and Boldo Faita, "Alerting users to items of current interest". United States Patent No. INT1P206.
4. 1984 Aviv Bergman "An optical height measuring system for operation in a noisy environment", Patent No. 71948 Israel

• **Research Grants**

1. 2003-4 Benhamou Family Foundation, Founding gift for the Center for Integrative Research in Science and the Humanities, up to \$35,000.
2. 2002-3 The Rockefeller Foundation, Colure & Creativity Program, \$100,000 per year. (Co-Investigator with PI - Tom Wasow).
3. 2002-3 Program for Jewish Studies, Stanford University, funding for the Center for Integrative Research in Science and the Humanities, \$25,000.
4. 2002-3 Presidential Funds, Stanford University, funding for the Center for Integrative Research in Science and the Humanities, \$50,000.
5. 2002-3 Computer Science Department, Stanford University, \$25,000, unrestricted fund.
6. 2001-2 Computer Science Department, Stanford University, \$25,000, unrestricted fund.
7. 2001-2 Presidential Funds, Stanford University, matching founding fund for the Center for Integrative Research in Science and the Humanities, up to \$25,000.
8. 2001-3 Benhamou Family Foundation, Founding gift for the Center for Integrative Research in Science and the Humanities, up to \$140,000.



9. 1997 Paul G. Allen Foundation, Founding gift for the Center for Computational Genetics and Biological Modeling. \$2,600,000 plus initial setup cost of ~\$250,000 Total of ~\$2,850,000 (Co-PI with Marcus Feldman).
10. 1992-1995 NASA - A Model of Vestibular Adaptation, started at SRI International, continued with Stanford University Department of Biological Sciences, Annual amount \$100,000. Total of \$300,000
11. 1989-1991 AFOSR - Evolutionary Approach to Designing Neural Networks, SRI International. Annual amount \$100,000. Total of \$200,000.
12. 1989 Gas Research Institute - Gas and Oil Log Interpretation using Adaptive Systems, SRI International. Annual amount of \$50,000. Total of \$50,000.
13. 1988-1992 Fujitsu - Study of Neural Networks, Genetic Algorithms and Complex Systems for Computer System Applications, SRI International. Annual amount \$60,000. Total of \$300,000.
14. 1987-1988 US-Postal Service - The Use Neural Networks for Address-Block Ranking SRI International. Annual amount of \$50,000. Total of \$100,000.

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**List of Potential Referees**

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