

# CURRICULUM VITAE

University of Idaho

**NAME:** Heckendorn, Robert B.

**DATE:** Sep 6, 2014

**RANK OR TITLE:** Associate Professor

**DEPARTMENT:** Computer Science

**OFFICE LOCATION AND CAMPUS ZIP:** JEB 226, 1010

**OFFICE PHONE:** None

**FAX:** 885-9052

**EMAIL:** heckendo@cs.uidaho.edu

**WEB:** marvin.cs.uidaho.edu/~heckendo

**DATE OF FIRST EMPLOYMENT AT UI:** August 1999

**DATE OF TENURE:** May 2006

**DATE OF PRESENT RANK OR TITLE:** May 2006

## EDUCATION:

### Degrees:

**Ph.D., Computer Science**, Colorado State University, Fort Collins, Colorado, 1999,  
Dissertation Title: *Patterns of Epistasis and Optimization Problem Difficulty for Evolutionary Algorithms*, Major Professor: Dr. Darrell Whitley

**M.S., Computer Science**, University of Arizona, Tucson, Arizona, 1979

**B.A., Mathematics**, University of Oklahoma, Norman, Oklahoma, 1977,

## EXPERIENCE:

### Teaching, Extension and Research Appointments:

**Fully Paid Sabbatical Leave** for one year to the *BEACON Center for the Study of Evolution in Action*, an NSF funded center for research at Michigan State University (2011-2012)

**Associate Professor in Computer Science** University of Idaho, Moscow, Idaho (May 2006-present)

**Assistant Professor in Bioinformatics and Computational Biology** University of Idaho, Moscow, Idaho (2002-2006, appointment via the BCB program)

**Assistant Professor in Computer Science** University of Idaho, Moscow, Idaho (Aug 1999-present)

**Teaching Assistant** Colorado State University, Fort Collins, Colorado (1999)

**Research Assistant** Colorado State University, Fort Collins, Colorado (1995-1998)

**Teaching Assistant** University of Arizona, Tucson, Arizona (Aug 1977-Jul 1979)

**Student Consultant** University of Oklahoma, Norman, Oklahoma (Aug 1972-Jul 1977)

**Summer Student (Computer Lab Assistant)** University of Oklahoma, Norman, Oklahoma (1971)

### Non-academic Employment:

**Research and Development Engineer** Hewlett-Packard Corporation (Calculator Div., Corvallis, Oregon; Lisp Div., Software Development Div., Fort Collins, Colorado) (Jul 1979-Jan 1995)

**Summer Student** Amoco Research Lab, Tulsa, Oklahoma (Jun 1978-Aug 1978)

### Consulting:

**Private Consulting** Chrysalis Software, Fort Collins, Colorado (Jan 1995-Jul 1999)

**Affiliations (University of Idaho):**

BEACON center for the Study of Evolution in Action (Michigan State) (BEACON)  
 Initiative for Bioinformatics and Evolutionary Studies (IBEST)  
 Center for Secure and Dependable Systems (CSDS)  
 Bioinformatics and Computational Biology degree program (BCB)

**TEACHING ACCOMPLISHMENTS:**

**Areas of Specialization:** Evolutionary Computation, Epistasis and Evolutionary Processes, Machine Learning, Walsh Analysis, the Emergence of Cooperation, Bioinformatics, Computational Biology, Languages and Compilers, Algorithms for Message Passing Architectures

**Honors and Awards in Teaching:**

Outstanding Faculty Award, voted by ACM Student Chapter, 2005-2006, 2006-2007  
 Naval Reserve Officer Training Corps (NROTC) Faculty Excellence Award, 2005

**Undergraduate Student Projects:**

Semester	Class	Project Description
Spring 2001	CS481	Function database tool for use with my EC research.
Fall 2001	CS480	Student advising tool much like a corporate FAQ/support web page.
Fall 2001	CS480	Thermal monitoring and shutdown tool for Beowulf cluster.
Fall 2002	CS480	Extension of advising tool
Fall 2002	CS480	General purpose on-line signup sheet
Spring 2003	CS480	A domain specific Wiki for genealogy

**Materials Developed for Education:**

**Beowulf Supercomputer:** Using a Project Based Learning (PBL) approach I involved the students in my CS499 (Fall 2002) in the specification, design, purchase, construction, and software installation for a Beowulf Supercomputer cluster of 64 computers for use as a departmental and interdepartmental research tool. The Beowulf was then used to teach parallel computer programming (Spring 2001) using MPI. The design course was repeated for construction of the second Beowulf in (Spring 2003).

**Web Based Class Program Feedback System:** Constructed a automated web based assignment submission, pregrading feedback, and final grading system for use in computer science classes where complex executable assignments need to be managed. The system gives students feedback during development and final grading. It also provides a mechanism for delivering, via the web, the assignments to grade by hand to a human grader. This improves communication with the student on complex requirements, allows for monitoring of student progress and greatly simplifies the process of providing help by making it trivial to reconstruct and debug each student's assignment.

**Courses Developed:**

I developed all courses entirely from scratch. Although I looked at the work of previous instructors, I generally had my own ideas about content and direction in every case.

**Courses Taught:** Evaluated on a scale of 0 to 4. Numbers are (instructor quality)/(course quality).

Semester	Course No.	Course Name	Avg. Eval Inst/Course	Num. Resp.	End Semester Class Size
Fall 1999	CS310	Programming Languages (new)	3.2	17	28
Spring 2000	CS310	Programming Languages	2.8	26	28
Spring 2000	CS472/572	Evolutionary Computation (new)	3.6	9	10+5(video)
Fall 2000	CS310	Programming Languages	3.2	18	23
Fall 2000	CS499/599	Beowulf Cluster Design (new)	4.0	2	9
Spring 2001	CS310	Programming Languages	3.3	32	41
Spring 2001	CS404/504	High Performance Computing (new)	3.3	14	18
Fall 2001	CS310	Programming Languages (new)	3.4	21	30
Spring 2002	CS310	Programming Languages	3.5	15	27
Fall 2002	CS310	Programming Languages	3.5/3.2	17	31+6(video)
Spring 2003	CS445	Compilers (new)	2.9/2.9	20	35
Spring 2003	CS499	Beowulf Design (new)	3.9/3.9	8	12
Fall 2003	CS504(CS515)	Computational Biology (new)	3.0/3.1	9	23+3(video)
Spring 2004	CS445	Compilers	3.7/3.4	23	42+4(video)
Fall 2004	CS472/572	Evolutionary Computation	3.6/3.8	18	30+3(video)
Spring 2005	CS445	Compilers	3.5/3.3	15	31+3(video)
Fall 2005	CS415/515	Computational Biology	3.0/2.8	6	10
Spring 2006	CS445	Compilers	2.5/2.7	12	43+4(video)
Fall 2006	CS472/572	Evolutionary Computation	3.3/3.3	4	12+0(video)
Fall 2006	CS404/504	Artificial Life and Biosimulation (new)	(too few)	-	8
Fall 2006	CS445	Compilers	4.0/4.0	2	5(video only)
Spring 2007	CS445	Compilers	3.7/3.6	10	19+2(video)
Spring 2007	CS210	Programming Languages	3.6/3.4	5	14+6(video)
Fall 2007	CS445	Compilers	4.0/4.0	4	6+2(video)
Fall 2007	CS210	Programming Languages	3.8/3.5	11	17
Spring 2008	CS415/515	Computational Biology	3.7/3.3	3	10+1(video)
Spring 2008	CS210	Programming Languages	3.7/3.6	7	11
Fall 2008	CS210	Programming Languages	3.3/3.1 <sup>1</sup>	10	21
Fall 2008	CS472/572	Evolutionary Computation	3.5/4.0	2	6
Fall 2008	CS401/501	CS Seminar (new, shared w/Dr. Soule)	3.3/3.5	4	12
Spring 2009	CS210	Programming Languages	3.7/3.4	12	24
Spring 2009	CS504	Stochastic Optimization (new, w/Dr. Soule)	(too few)	-	4
Fall 2009	CS445	Compilers	3.8/3.8	6	13
Fall 2009	CS105	Introduction to CS as a profession	3.1/2.8	23	47
Spring 2010	CS120	Intro to programming (all: group lec + 3 labs)	3.2/3.2	18	57
Spring 2010	CS210	Programming Languages	3.6/3.4	7	17
Spring 2010	CS499/502	COTS Robots (w/Dr. Soule)	(too few)	-	8
Fall 2010	CS445	Compilers	3.6/3.6	5	16+4(video)
Fall 2010	CS472/572	Evolutionary Computation	3.7/3.7	7	15+4(video)
Spring 2011	CS210	Programming Languages	3.6/3.3	13	28
Spring 2011	CS415/515	Computational Biology	2.9/2.7	8	19
Spring 2011	CS499	Robots (w/Dr. Soule)	(too few)	-	7
Fall 2011		_____ On Sabbatical _____			
Spring 2012		_____ On Sabbatical _____			
Fall 2012	CS472/572	Evolutionary Computation	1.0/1.0 <sup>2</sup>	1	7 (video)
Fall 2012	CS270	Systems Software (new)	3.5/3.4	11	26
Spring 2013	CS395/M395	Analysis of Algorithms (new)	3.1/3.2	13	23
Spring 2013	CS415/515	Computational Biology	3.0/3.0	2	7+3(video)
Fall 2013	CS105	Introduction to CS as a profession (rework course)	3.7/3.4	28	61
Fall 2013	CS445	Compilers	3.8/4.0	4	18+3(video)
Spring 2014	CS210	Programming Languages	3.4/3.2	5	23
Spring 2014	CS270	Systems Software	3.4/3.4	8	27
Spring 2014	CS401/501	CS Seminar	(too few)	-	17
Fall 2014	CS112	Introduction to CS			
Fall 2014	CS470	Artificial Intelligence (new)			

---

<sup>1</sup>All 4s and 5s, one person hated it. Ignoring them should be 3.6/3.4.  
<sup>2</sup>person who turned in eval got D. Rest of class got As and one B

**Students Advised:**

I normally advise approximately 30 undergraduate and 5 graduate students a semester. I have advised two masters students and one Ph.D. to completion.

**Graduates Supervised:**CURRENT STUDENTS

**Joshua Rubini** (MS) - (Aug 2011) Topic: Cooperative robotics. All but Thesis. Working at Microsoft Research and with me via Skype.

GRADUATED STUDENTS

**Armand Bankhead** (Ph.D. BCB) - (Jan 2003 - Dec 2006) Title: "Computational Modeling of Cancer Etiology and Progression Using Neural Networks and Genetic Cellular Automata"

**Smitha Kara (nee Surakanti)** (MS BCB thesis option) - (Jan 2003 - Aug 2005) Title: "Using Classic Optimization to Speed up burn in and Mixing in Markov Chain Monte Carlo Methods for Phylogenetic Inference"

**Jian Shen** (MS CS thesis option) - (Jan 2003 - May 2004) Work was on evolutionary optimization of maximum likelihood trees and the "longest branch hypothesis". Title: "A New Representation Scheme for Genetic Algorithms for Solving the Phylogenetic Inference Problem"

INACTIVE STUDENTS

**Max McKinnon** (MS) - (Aug 2012) Topic: Epistatic Analysis. Works in San Fransisco for signal processing firm. Does not respond to email. Considered MIA.

**Damian Ball** (MS) - (Aug 2010) Topic: Improving quality of sequence calls for the Roche 454 DNA pyrosequencer. (shared with Dr. Soule)

**Matt Halliday** (PhD) - (Aug 2010) Topic: Using Ant Colony Optimization to do realtime evacuation planning for cities. (working in conjunction with Ahmed Abdel-Rahim from Civil Engineering, for medical reasons withdrew from school.)

**Brian Kramer** (Ph.D. BCB) - (Sep 2004 - 2007) Exploring effective divide and conquer algorithms for phylogenetic inference on massively parallel machines

**Timothy Meekhof** (MS CS thesis option) - (Sep 2004 - 2007) Protein classification using Markov models and evolutionary optimization of sequence translation

**John Russo** (Ph.D. CS) - (Sep 2003 - ?) Remote student

**Kurt Derr** (Ph.D. CS) - (Fall 2002 - ?) Remote student from INEL. (switched Adviser)

**Jon Meyer** (Ph.D. CS) - (Jan 2003 - Sep 2005) Learning subtasks by evolutionary means (switched Adviser)

**Kavitha Madduri** (MS CS) - (Dec 2000 - Jul 2002) Elogo (a research platform for the study of the evolution of cooperative/competitive behavior)

**Sreekanth Malladi** (MS CS) - (May 2001 - Nov 2001) Evolutionary Approach to Cracking Security Protocols (served as temporary major adviser while adviser on leave)

**Karl Riley** (MS CS) - (Jul 2000 - Sep 2000) Elogo development (went to industry)

**Graduate Committee Work:**CURRENT STUDENTS

**Hua Feng** (PhD Bioinformatics) 2009-

**Heyan Huang** (MS Computer Science) 2012-

**Juan Marulanda** (MS Computer Science) Anticipatory Communications and Swarm Behavior 2012-2013

**Ilya Urievich Zhbannikov** (Ph.D. BCB) Bioinformatic Tools for Small Sequence Analysis 2010-

**Jayandra Pokharel** (MS CS) Robot Vision 2012-

**Ying Qian Zhan** (Ph.D. BCB) 2013-

GRADUATED STUDENTS

- Jafar Al-Gharaibeh** (Ph.D. CS) Parallel Computation Features in the Unicon Language 2007-2012
- Matt Settles** (Ph.D. CS) Microarray Analysis 2006-2011
- Ziad A. Al-Sharif** (Ph.D. CS) Extensible Debugging Architectures 2007-2009
- Audra Johnson** (MS BCB) Disordered protein prediction 2007-2009
- Xiaojun Hu** (Ph.D. BCB) Computer Modeling of Potato Virus Crossover and Resistance 2006-2009
- Jason Stevens** (MS CS) Controlling code bloat with increased crossover probabilities 2006-2007
- Jennifer Ripplinger** (Ph.D. BCB) Bioinformatic databases 2004-(switched Advisers)
- Jorge Williams** (Ph.D. CS) High performance graphics algorithms 2002-2008
- Ryan Bradetich** (MS CS) Security 2007-2007
- Russell Thomason** (MS CS) Using evolved teams on the disordered protein problem 2006-2007
- Alan Piszcz** (Ph.D. CS) Methodical analysis of population size on effectiveness of evolutionary techniques on problems of varying difficulty 2002-2006
- Jose Miguel Ponciano** (Ph.D. Math/Stat) Statistical Models for Population Genetics 2004-2006
- Matt Settles** (MS CS) Swarm Based Optimization 2005-2006
- Hua Feng** (MS BCB) 2000-2006
- Zaid Abdo** (Ph.D. Math) Statistical Analysis of Popular Bioinformatic Applications and Algorithms 2003-2005
- Brian Auer** (MS ME thesis option) Optimizing Space Frames with Evolutionary Computation 2004-2005
- Gerard Goh** (MS CS thesis option) A Database Based Analysis of Error Rates in the PONDR Series of Disordered Protein Predictors 2001-2005
- Xian Liu** (MS CS thesis option) Models of Code Growth in Genetic Programming 2004-2005
- Johnathan Graham** (Ph.D. CS) Dynamic Reallocation of Data in Object Oriented Data Bases 2001-2005
- Matt Settles** (MS CS thesis option) Swarm Based Optimization 2003-2005
- Christopher Willis-Ford** (MS CS) 2002-2004
- Joseph Richards** (MS CS) 2000-2003
- Sreekanth Malladi** (MS CS thesis option) Preventing Replay Attacks on Security Protocols 2002-2003
- Huaqiang Wu** (Ph.D.) Using Game Theory to Optimize Defensive Response to Network Attacks 2002-2003 (I resigned from committee due to lack of progress)
- Rob Shepherd** (MS CS) Fault Tolerance in Evolved Sorting Networks ???-2002
- Mark Meysenburg** (Ph.D. CS) Random Number Generator Quality and Genetic Algorithm Performance 2000-2002
- John Determan** (MS CS) 1998-2000

**SCHOLARSHIP ACCOMPLISHMENTS:****Refereed Journal Publications († = student author):**

- Daniel M Weinreich, Yinghong Lan, C Scott Wylie, Robert B Heckendorn, **Should Evolutionary Geneticists Worry About Higher-Order Epistasis?**, *Current Opinion in Genetics & Development*, Elsevier, 2013
- Terence Soule, Robert B. Heckendorn, **A Practical Platform for On-Line Genetic Programming for Robotics**, *Genetic Programming Theory and Practice X*, p15-29, Springer, 2013
- Terence Soule, Robert B. Heckendorn, **COTSBots: Computationally Powerful, Low-Cost Robots for Computer Science Curriculums**, *Journal of Computing Sciences in Colleges*, 27(1), ACM, 2011

- Shude Zhou, Robert B. Heckendorn and Zengqi Sun, **Detecting the Epistatic Structure of Generalized Embedded Landscape**, *Genetic Programming and Evolvable Machines*, 9(2), pp125–155, Springer, 2008
- Armand Bankhead III<sup>†</sup>, Robert B. Heckendorn, **Using Evolvable Genetic Cellular Automaton to Model Breast Cancer** *Genetic Programming and Evolvable Machines (special issue on medical applications)*, 8(4), pp 381-393, Elsevier Ltd, 2007
- Armand Bankhead III<sup>†</sup>, Nancy S. Magnuson, Robert B. Heckendorn, **Cellular Automaton Simulation Examining Progenitor Hierarchy Structure Effects on Mammary Ductal Carcinoma *in Situ***, *Journal of Theoretical Biology*, 246(3), pp 491-498, Elsevier Ltd, 2007
- Armand Bankhead III<sup>†</sup>, Nancy S. Magnuson, and Robert B. Heckendorn, **Gene Knockout Experiments to Quantify a G2/M Genetic Network Simulation for Mammary Cancer Susceptibility**, *In Silico Biology* <http://www.bioinfo.de/isb/2006/06/0017/>, 6(0017), 2006
- R. B. Heckendorn, A. H. Wright, **Efficient Linkage Discovery by Limited Probing**, *Journal of Evolutionary Computation*, 12(4), pp. 517-545, MIT Press, Cambridge, MA., 2004 (presented material beyond 2003 work of the same name)
- K. Imamura<sup>†</sup>, T. Soule, R. B. Heckendorn, J. A. Foster, **Behavioral Diversity and a Probabilistically Optimal GP Ensemble**, *Genetic Programming and Evolvable Machines*, 4(4), pp. 235-253, Kluwer Academic Publishers. 2003
- Darrell Whitley, Robert B. Heckendorn, Soraya Stevens, **Hyperplane Ranking, Nonlinearity and the Simple Genetic Algorithms** *Information Sciences (special issue on evolutionary computation)* 156(3-4), pp. 123-145, Elsevier, B.V., Amsterdam, Netherlands, 2003
- R. B. Heckendorn, **Embedded Landscapes**, *Journal of Evolutionary Computation*. 10(4), pp. 345-370, MIT Press, Cambridge, MA., Winter, 2002
- R. B. Heckendorn, **Building a Beowulf: Leveraging Research and Department Needs for Student Enrichment via Project Based Learning**. *Journal of Computer Science Education*, 12(4), pp. 255-273, Swets & Zeitlinger Publishers, The Netherlands, 2002
- Terence Soule and Robert B. Heckendorn, **An Analysis of the Causes of Code Growth in Genetic Programming**. *Journal of Genetic Programming and Evolvable Hardware*. Kluwer Academic Publishers. 3(3), pp283-309, 2002
- Darrell Whitley, Soraya Rana, and Robert B. Heckendorn, **Exploiting Separability in Search: The Island Model Genetic Algorithm**. *Journal of Computing and Information Technology (Special Issue on Evolutionary Computing)*. 7(1), pp. 33-47. 1999.
- R. B. Heckendorn and Darrell Whitley, **Predicting Epistasis from Mathematical Models**. *Evolutionary Computation*. MIT Press. Cambridge, MA. 7(1). pp. 69-101. 1999.

#### Refereed Conference Publications:

- Solomon, Michael and Heckendorn, Robert B and Soule, Terence, **A Comparison of a Communication Strategies in Cooperative Learning**. *GECCO 2012: Proceedings of the Genetic and Evolutionary Computation Conference*, pp153-160, ACM, 2012
- Soule, T. and Heckendorn, Robert B, **Developmental Scalable Hierarchies for Multi-agent Swarms**. *GECCO 2011: Proceedings of the Genetic and Evolutionary Computation Conference*, pp207-208, ACM, 2011.
- Terence Soule and Robert B. Heckendorn, Brian Dyre, and Roger Lew, **Ensemble Classifiers: AdaBoost and Orthogonal Evolution of Teams**. *Genetic Programming Theory and Practice VIII*, pp 55-69, 2011.
- Soule, T. and Heckendorn, R.B, **A Developmental Algorithm for Multi-agent Swarms with Scalable Hierarchies**. *GECCO 2010: Proceedings of the Genetic and Evolutionary Computation Conference*, pp647-648. ACM, 2010.
- Terence Soule, and Robert B. Heckendorn, **Environmental Robustness in Multi-Agent Teams**, *GECCO 2009: Proceedings of the Genetic and Evolutionary Computation Conference*, ACM Press, New York, NY, pp 177-184, ACM, 2009

- Joshua Rubini<sup>†</sup>, Robert B. Heckendorn, and Terence Soule, **Evolution of Team Composition in Multi-Agent Systems**, *GECCO 2009: Proceedings of the Genetic and Evolutionary Computation Conference*, ACM Press, New York, NY, pp 1075-1082, ACM, 2009
- Timothy Meekhof<sup>†</sup>, Terence Soule, and Robert B. Heckendorn, **Improving Markov Chain Classification using String Transformations and Evolutionary Search**, *GECCO 2009: Proceedings of the Genetic and Evolutionary Computation Conference*, ACM Press, New York, NY, pp 1259-1266, ACM, 2009
- Russell Thomason<sup>†</sup>, Robert B. Heckendorn, and Terence Soule **Training Time and Team Composition Robustness in Evolved Multi-Agent Systems**, *Genetic Programming, Proceedings of the 11th European Conference, EuroGP 2008*, pp 1-12, 2008
- Shude Zhou<sup>†</sup>, Zengqi Sun, and Robert B. Heckendorn, **Extended probe method for linkage discovery over high-cardinality alphabets**, *GECCO 2007: Proceedings of the Genetic and Evolutionary Computation Conference*, ACM Press, New York, NY, pp 1484-1491, ACM, 2007
- Shude Zhou<sup>†</sup>, Robert B. Heckendorn, and Zengqi Sun, **Generalized Embedded Landscape and Its Decomposed Representation**, *Lecture Notes in Computer Science 4247/2006*, pp 9-17, Springer Berlin, Berlin, 2006
- Terence Soule, Robert B. Heckendorn, **Improving Performance And Cooperation In Multi-Agent Systems**, *Genetic Programming Theory and Practice 2007*, Center for Complex Systems, University of Michigan Springer, Chapter 13, 2007
- Timothy Meekhof<sup>†</sup>, Gary W. Daughdrill, Robert B. Heckendorn, **String transformation-based Bayesian classification on proteins**, *GECCO 2006: Proceedings of the Genetic and Evolutionary Computation Conference*, ACM Press, New York, NY, pp301-302, 2006
- Jason Stevens<sup>†</sup>, Robert B. Heckendorn, Terry Soule, **Exploiting Disruption Aversion to Control Code Bloat**, *GECCO 2005: Proceedings of the Genetic and Evolutionary Computation Conference*, ACM Press, New York, NY, pp1605-1612, 2005
- Tim Meekhof<sup>†</sup>, Robert B. Heckendorn, **Using Evolutionary Optimization to Improve Classification with Limited Training Data**, *GECCO 2005: Proceedings of the Genetic and Evolutionary Computation Conference*, ACM Press, New York, NY, pp2211-2212, 2005
- Armand Bankhead III<sup>†</sup>, Nancy Magnuson, Robert B. Heckendorn, **Modeling Multicellular and Tumorous Existence with Genetic Cellular Automata**, *Artificial Life IX, Proceedings of the Ninth International Conference on the Simulation and Synthesis of Living Systems*, Bradford Books, pp220-225, 2004
- Jian Shen<sup>†</sup> and Robert B. Heckendorn, **Discrete Branch Length Representations for Genetic Algorithms in Phylogenetic Search** *Applications of Evolutionary Computing*, LNCS3004, Springer-Verlag, Berlin, pp94-103, 2004 (I presented at EUROGP)
- Robert B. Heckendorn and Alden Wright, **Efficient Linkage Discovery by Limited Probing** *GECCO 2003: Proceedings of the Genetic and Evolutionary Computation Conference*, LNCS2724, Springer-Verlag, Berlin, pp1003-1011, 2003 (I presented)
- Robert B. Heckendorn **Partitioning, Epistasis, and Uncertainty**, *Foundations of Genetic Algorithms - 7*, Morgan Kaufmann Publishers, Inc., Palo Alto, CA., pp27-44, 2002 (I presented)
- S. Malladi<sup>†</sup>, J. Alves-Foss and R. Heckendorn. **On Preventing Replay Attacks on Security Protocols**. *Proceedings of the International Conference on Security and Management (SAM02)*, CSREA Press, Las Vegas, NV, USA, pp. 77-83, 2002 (Sreekanth presented)
- Kosuke Imamura<sup>†</sup>, Robert B. Heckendorn, Terence Soule, James A. Foster **N-version Genetic Programming via Fault Masking**, *Genetic Programming, Proceedings of the 5th European Conference, EuroGP 2002*, Springer-Verlag, Berlin, pp. 172-181, 2002. (Kosuke presented)
- Kosuke Imamura<sup>†</sup>, Robert B. Heckendorn, Terence Soule, James A. Foster **Abstention Reduces Errors - Decision Abstaining N-version Genetic Programming**, *GECCO 2002: Proceedings of the Genetic and Evolutionary Computation Conference*, Morgan Kaufmann Publishers, Inc., Palo Alto, CA., pp. 796-803, 2002. (Kosuke presented)



- Terence Soule and Robert B. Heckendorn. **Function Sets in Genetic Programming** (accepted as 1 page short version) *Proceedings of the Genetic and Evolutionary Computation Conference 2001*. Morgan Kaufmann Publishers, Inc., Palo Alto, CA., pp. 190, 2001.
- Robert B. Heckendorn, **Of Heisenberg and Epistasis** *Proceedings of the Genetic and Evolutionary Computation Conference 2001*. Morgan Kaufmann Publishers, Inc.. Palo Alto, CA., pp. 765, 2001.
- Heckendorn, R. B. and Soraya Rana and Darrell Whitley. **Polynomial Time Summary Statistics for a Generalization of MAXSAT**. Wolfgang Banzhaf and Jason Daida and Agoston E Eiben and Max H. Garzon and Vasant Honavar and Mark Jakiela and Robert E. Smith. *Proceedings of the Genetic and Evolutionary Computation Conference*. Morgan Kaufmann Publishers, Inc.. Palo Alto, CA. pp281-288 1999. (I presented)
- Heckendorn, R. B. and Soraya Rana and Darrell Whitley. **Test Function Generators as Embedded Landscapes**. *Foundations of Genetic Algorithms - 5*. Thomas Bäck and Wolfgang Banzhaf eds. Morgan Kaufmann Publishers, Inc.. Palo Alto, CA. 1999 (I presented)
- Heckendorn, R. B. **Walsh Functions and Predicting Problem Complexity**. *Artificial Neural Networks and Genetic Algorithms*. George D. Smith, Nigel C. Steele, and Rudolf F. Albrecht eds Springer-Verlag. Vienna, Austria. pp179-182, 1998 (I presented)
- Rana, Soraya and R. B. Heckendorn and Darrell Whitley. **A Tractable Walsh Analysis of SAT and its Implications for Genetic Algorithms**, *Proceedings of the Fifteenth National Conference on Artificial Intelligence*. AAAI Press. Menlo Park, CA. pp392-397. 1998 (Soraya presented)
- Heckendorn, Robert B., L. Darrell Whitley, and Soraya Rana. **Nonlinearity, Hyperplane Ranking and the Simple Genetic Algorithm**. *Foundations of Genetic Algorithms - 4*. Richard K. Belew and Michael Vose eds Morgan Kaufmann Publishers, Inc.. Palo Alto, CA. 1997 (I presented)
- Heckendorn, R. B. and D. Whitley. **A Walsh Analysis of NK-Landscapes**. *Proceedings of the 7th International Conference on GAs*. Morgan Kaufmann Publishers, Inc., Palo Alto, CA. Thomas Bäck ed. 1997 (I presented)
- Whitley, Darrell, Soraya Rana, R. B. Heckendorn. **Island Model GAs and Linearly Separable Problems**. AISB Workshop on Evolutionary Computation. 1997 (Darrell presented)

#### Book Chapters (invited/peer reviewed):

- Whitley, D., S. Rana, and R. Heckendorn. **Representation Issues in Neighborhood Search and Evolutionary Algorithms**. *Genetic Algorithms and Evolution Strategies in Engineering and Computer Science*. D. Quagliarella and J. Periaux and C. Poloni and G. Winter. pp39-57, John Wiley. Chichester, England. 1998

#### Technical Reports (not refereed):

- Heckendorn, R. B. and Charles Anderson. **A Multigrid Form of Value Iteration Applied to a Markov Decision Problem**. Colorado State University. CS-98-113. 1998

#### Miscellaneous Publications (invited/not refereed):

- Soule, T. and Heckendorn, R.B. **A Developmental Approach to Evolving Scalable Hierarchies for Multi-agent Swarms**, *GECCO 2010: Proceedings of the Genetic and Evolutionary Computation Conference*, Workshop on Evolutionary Computation and Multi-Agent Systems and Simulation (ECoMASS), pp1769-1776, ACM, 2010
- Lisa J. Carlson, Raymond Dacey, Robert B. Heckendorn and Annie S. Wu, **Computational Modeling of the Traditional Deterrence Game**. At the conference: International Studies Association 2008, San Francisco, 2008 (I presented)
- Soule, Terence and Robert B. Heckendorn. **Evolutionary optimization of cooperative heterogeneous teams**. At the conference: Evolutionary and Bio-inspired Computation: Theory and Applications Volume 6563 – SPIE (The International Society of Optical

Engineering), Published on-line, Misty Blowers, Alex F. Sisti, Editors, SPIE, 2007 (I presented)

Heckendorn, R. B. and Soraya Rana Stevens (uncredited editors) **Proceedings of the GECCO '01 Workshop** Morgan Kaufmann, 2001

#### Invited Talks:

**COTSbots: Powerful - Affordable - Accessable Robots** presented to Palouse Knowledge Corridor in Pullman, Nov 2012 (in coordination with a talk given by Trence Soule on this topic).

**Nonclassical Mathematical Tools for Conceptualizing Epistasis** Talk customized for audience and presented in bioinformatics seminar at Brown University, Apr 2012. Invited by Dr. Weinreich.

**Nonclassical Mathematical Tools for Conceptualizing Epistasis** Talk presented to BEACON cross institutional Friday lecture series. broadcast from Michigan State to 5 universities total, Dec 2011

**BEACON's Multi-institutional Partnership** presented to the visiting NSF site review panel, Michigan State University, Dec 2011

**Evolution in Action at the University of Idaho** presented at BEACON Day at North Carolina A&T, Nov 2011

**Using Evolution** An introduction to evolutionary computation presented to interdisciplinary bioinformatics class, Michigan State University, Dec 2011

**Getting an Intuition for Fitness Landscapes** A presentation to Kalyan Deb's Evolutionary Computation Class on the structure of fitness landscapes, Michigan State University, Oct 2011

**Shared Views of Epistasis** An presentation of my research directions to the Evolution of Intelligence seminar, Michigan State University, Sep 2011

**Measuring the Bounds of Naturally Occurring Epistasis** Talk at *9<sup>th</sup> Annual Plant Sciences Institute Symposium on Epistasis: Predicting Phenotypes and Evolutionary Trajectories*, Iowa State University, Jun 2007

**Introduction to Genetic Algorithms** Tutorial at GECCO-2003, Chicago, Illinois, Jul 2003

**Searching for Epistasis** IBEST Seminar Series on "Doing Evolution", University of Idaho, Feb 2003

**Introduction to Genetic Algorithms** Tutorial at GECCO-2002, New York City, New York, Jul 2002

**What Problems Can Evolution Solve? Epistasis and the Problem Space** IBEST Seminar Series on "Explaining Evolution", University of Idaho, Apr 2002

**Polynomial Time Walsh Analysis** Tutorial at GECCO-2000, Orlando, Florida, Jul 2000

**Walsh Analysis of Optimization Problems for Genetic Algorithms**, Colorado State University Department of Mathematics Seminar, Fort Collins, Colorado, Dec 1998

**What Makes Problems Hard for Genetic Algorithms**, University of Wyoming Computer Science Colloquium, Larimie, Wyoming, Oct 1998

#### Grants:

Dates	Granting Agency	Total/Mine <sup>3</sup>	PI <sup>4</sup>	Comments
2013	BEACON Center (competative grants)	\$168,000	R.B. Heckendorn et al	Distributed, Onboard Evolution in a Robotic Cloud
2013	BEACON Center (competative grants)	\$5,000	R.B. Heckendorn, Judi Brown Clarke	BEACON Summit to Catalyze Diversity
2012	BEACON Center (competative grants)	\$104,000/\$41,000	R.B. Heckendorn	Cross-fertilization of Techniques for Epistasis from Evolutionary Computation and Biology
2004	Intel Corporation	\$24,000	R.B. Heckendorn	Processors for Beowulf
2003	Intel Corporation	\$24,000	R.B. Heckendorn	Processors for Beowulf
2003	Micron Technologies	\$490	R.B. Heckendorn	Beowulf memory modules
2003	Idaho EPSCoR	\$5,000	R.B. Heckendorn	Staff funding for access grid
2002-2007	NIH, COBRE (IP20 RR16448-01)	\$10,013,547/\$100,000	L. Forney	Construction of next Beowulf
2002-2004	NIH, BRIN (IP20 RR16454-01)	\$5,909,232/\$300,000	M. Laskowski	Upgrading Beowulf for Idaho researchers
2001	Idaho EPSCoR	\$50,000	R.B. Heckendorn	Purchase access grid node
2001	Micron Technologies	\$14,000	R.B. Heckendorn	Memory modules
2000-2003	NSF, EPSCoR (EPS 0080935)	\$499,994/\$45,000	J.A. Foster	Creating prototype Beowulf cluster
2000	University of Idaho, competitive seed grant	\$9,000	R.B. Heckendorn	Elogo platform

### Materials Developed for Research:

**Beowulf Supercomputers:** I conceived of and constructed our first Beowulf supercomputer. This cluster of 64 PCs has become a important research tool in the department. The speed of the machine allows an experiment that would take a 24 hours on the fastest machine in our department to run to run in 25 minutes. The machine has generated numerous press articles including a mention in the Christian Science Monitor and a picture in the University of Idaho Foundation Annual Report. The machine has proven an invaluable in speeding research and was used as a key infrastructure component of follow-on NIH BRIN and COBRE grants. I designed and ordered the first installment of our second Beowulf cluster 100+ dual CPU servers. We now own three Beowulf clusters as a result and a 1200 square foot supercomputing facility for use by researchers throughout Idaho.

**Access Grid Node:** I have championed the first installation in Idaho of an Access Grid Node at the University of Idaho. This will be the first of a series of classroom size interactive internet 2 based teleconferencing classrooms. This technology provides an economical way to leverage faculty and improve inter/intrastate research collaboration. First meeting with someone other than support personnel occurred on Feb 7, 2003. This has since been used for regional BRIN and NIH meetings. It was the prototype for in the Idaho wide teleconferencing portion of \$10M NIH infrastructure grant calling for construction of other larger access grid nodes such as in LSS 277.

### Professional and Scholarly Organizations:

American Association for Computing Machinery (ACM)

American Association for Artificial Intelligence (AAAI)

International Society for Genetic and Evolutionary Computation (ISGEC)

<sup>1</sup>(Total amount of grant)/(amount under my control). If no denominator given then all of the funds are under my control.

<sup>2</sup>I am an investigator in grants where I am not PI.

now Association for Computing Machinery Special Interest Group in  
Evolutionary Computation (SIGEVO)  
International Society for Computational Biology (ISCB)

#### **Honors and Awards in Research:**

Chosen to participate in the two week long **Workshop on Molecular Evolution** at the Marine Biological Laboratory Woods Hole, Massachusetts, Jul-Aug 2003 (internationally competitive application)

#### **Conferences and Workshops Attended:**

**Genetic and Evolutionary Computation Conference '09 (GECCO-2009)**, Montreal, Canada, Jul 2009

**Genetic and Evolutionary Computation Conference '08 (GECCO-2008)**, Atlanta, Jul 2008

**9<sup>th</sup> Annual Plant Sciences Institute Symposium on Epistasis: Predicting Phenotypes and Evolutionary Trajectories**, Iowa State University, Jun 2007

**Evolutionary and Bio-inspired Computation: Theory and Applications SPIE (The International Society of Optical Engineering)**, Orlando, Florida, April 2007

**Genetic and Evolutionary Computation Conference '06 (GECCO-2006)**, Seattle, Jul 2006

**Genetic and Evolutionary Computation Conference '05 (GECCO-2005)**, Washington D.C., Jun 2005

**Genetic and Evolutionary Computation Conference '04 (GECCO-2004)**, Seattle, Washington, Jul 2004

**European Conference on Genetic Programming '04 (EuroGP-2004)**, Coimbra, Portugal, Apr 2004

**Dagstuhl Workshop on Evolutionary Computation**, (by invitation only), Dagstuhl, Germany, Jan 2004

**Workshop on Molecular Evolution at the Marine Biological Laboratory**, (competitive application), Woods Hole, Massachusetts, Jul-Aug 2003

**Pacific Symposium of Biocomputing**, Hawaii, Jan 2003

**Genetic and Evolutionary Computation Conference '03 (GECCO-2003)**, Chicago, Illinois, Jul 2003

**Genetic and Evolutionary Computation Conference '02 (GECCO-2002)**, New York City, New York, Jul 2002

**Foundations of Genetic Algorithms 7**, Malaga, Spain, Apr 2002

**Dagstuhl Workshop on Evolutionary Computation**, (by invitation only), Dagstuhl, Germany, Jan 2002

**First Annual Institutional Development Award (IDeA) Program Meeting**, Oklahoma City, Oklahoma, Oct 2001

**Alaska Meeting of Western EPSCoR States to build research collaborations**, Fairbanks, Alaska, Aug 2001

**Genetic and Evolutionary Computation Conference '01 (GECCO)**, San Francisco, California, Jul 2001

**Genetic and Evolutionary Computation Conference '00 (GECCO)**, Las Vegas, Nevada, Jul 2000

**Supercomputer 2000** Dallas, Texas, Jun 2000

**Genetic and Evolutionary Computation Conference '99**, Orlando, Florida, Jul 1999

**Foundations of Genetic Algorithms 5 (FOGA)**, Leiden, Netherlands, Sep 1998

**AAAI-98**, Madison, Wisconsin, Jul 1998

**CRA Academic Careers Workshop**, Madison, Wisconsin, Jul 1998  
**The Seventh International Conference on Genetic Algorithms (ICGA)**, East Lansing, Michigan, Jul 1997  
**International Conference on Artificial Neural Networks and Genetic Algorithms '97**, Norwich, England, Apr 1997  
**Foundations of Genetic Algorithms 4 (FOGA)**, San Diego, California, Aug 1996  
**The Sixth International Conference on Genetic Algorithms (ICGA)**, Pittsburgh, Pennsylvania, Aug 1995  
**Foundations of Genetic Algorithms 3 (FOGA)**, Estes Park, Colorado, Aug 1994  
**The Fourth International Conference on Genetic Algorithms**, San Diego, California, Aug 1991  
**The International Joint Conference on Artificial Intelligence '87 (IJCAI)**, Milan, Italy, Aug 1987  
**The International Joint Conference on Artificial Intelligence '85 (IJCAI)**, Los Angeles, California, 1985  
**Object Oriented Programming, Systems, Languages, and Applications (OOPSLA)**, Portland, Oregon, 1983

**SERVICE:****Reviewing for Journals:**

**Artificial Intelligence** 2011  
**Computational Intelligence** 2011  
**Computational Statistics and Data Analysis** 2004, 2005  
**IEEE Transactions on Evolutionary Computation** 1999, 2000, 2005, 2007(twice)  
**Information Science** 2010  
**Journal of Evolutionary Computation** 1997, 1998, 2001, 2002, 2004, 2005  
**Journal of Genetic Programming and Evolvable Hardware** 2001, 2002, 2009  
**Nature Reviews Genetics** 2001

**Reviewing for Conferences:**

**European Conference on Genetic Programming (EuroGP)** 2001, 2003  
**Foundations of Genetic Algorithms (FOGA)** 2007, 2011  
**Genetic and Evolutionary Computation Conference (GECCO) Workshop on Gene Expression** 2001  
**Genetic and Evolutionary Computation Conference (GECCO)** 1999, 2002, 2006(2 sessions), 2007(2 sessions), 2012  
**Hawaii International Conference On System Sciences** 2002  
**Society for the Study of Artificial Intelligence and the Simulation of Behaviour (AISB) Workshop on Evolutionary Computation** 1997

**Committees:**

**Faculty Search Committee** (Math Department) 2010-2011  
**Borah Committee** (university wide) A faculty/student committee of the Borah Foundation (affiliated with the Martin Institute for Peace Studies and Conflict Resolution) at the University of Idaho, 2005-present  
**Curriculum Committee** (departmental) 2010-2011  
**Hardware Software Planning Committee** (departmental) 2008-2009 *Duties include strategizing the future direction of computing in the department, recommending hardware and software purchases and procedures and policies.*

**Graduate Student Application Committee** (departmental) 2006

**Distinguished Faculty in Bioinformatics Search Committee** (departmental) 2002-2003

**Hardware Software Planning Committee** (departmental) 1999-2002

**Library Liaison** (departmental) 1999-present *Coordinating the needs of the department with the library.*

**Chair Search Committee** (departmental) 2000 and 2001 (*two searches were performed*)

**Faculty Search Committee** (departmental) 2000, 2006

**Faculty Adviser** (departmental) for a student in the “Research Experiences for Undergraduates (REU)” summer program funded by NSF, 2003, 2004

**Professional Service:**

Served as external tenure review member for faculty member at an institution in the Portland area. 2009

National Science Foundation Advisory Panel in Biological Databases and Informatics, 2005, 2007

Chaired sessions at GECCO 2003, 2004, 2005

Invited to give tutorials at three separate GECCO meetings

**University Service Meetings:**

Represented BEACON Center for the Study of Evolution in Action at NSF site review visit giving a talk to and answering questions of NSF panel about BEACON cross institutional programs, Michigan State University, 2011

Represented BEACON Center for the Study of Evolution in Action at a recruitment event at North Carolina A&T, Greensboro, North Carolina, 2011

Represented our BRIN grant at **First Annual Institutional Development Award (IDeA) Program Meeting** Oklahoma City, Oklahoma, Oct 2001

Represented the State of Idaho at **Alaska Meeting of Western EPSCoR States to build research collaborations**, Fairbanks, Alaska, Aug 2001

**Service to the Community:**

Serve on the **Moscow City Transportation Committee**, Dec 2009-2011

Serve on the **Moscow City Paradise Path Committee**, 2010-2011

Serve on the **Moscow City Mobility Task Force**, 2010-2011