

Curriculum Vitae

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EDUCATION

B.S. Northern Illinois University, Physics (summa cum laude),
August 1987
Ph.D. University of Wisconsin-Madison, Physics/Mathematics,
December 1994
Thesis topic: Soft Supersymmetry Breaking Parameter Bounds
in the Minimal Supersymmetric Standard Model
Thesis advisor: Professor Bernice Durand

PROFESSIONAL EMPLOYMENT

9/03-present, Senior Research Scientist, Molsoft LLC. Investigated new methods for predicting protein-protein interactions using support vector machines. Developed a Bayesian method for estimating evolutionary rates. Developed a method for predicting the thermodynamic stability changes induced by mutations using Monte Carlo simulations. Supervised the development of a program for genomic functional annotation.

1/01-9/03, Research Associate, The Scripps Research Institute. Developed and implemented a new method for calculating biomolecular force field parameters using *ab initio* quantum mechanical calculations. Optimized parameters for a continuum electrostatics method to calculate the solvation free energy of small molecules. Studied docking and scoring procedures for virtual ligand screening to predict peptide-MHC binding affinities. Supervisor: Prof. Ruben Abagyan

8/01-8/02, Consultant, Plexus Vaccine Inc. Developed new methods for the prediction of loop regions in homology models of β -barrel proteins. Used Hidden Markov Model profiles in a novel method to identify autotransporter proteins in bacterial genomes.

8/99-12/00, Postdoctoral Research Assistant, Department of Bioengineering, University of California - San Diego. Developed new algorithms based on the fast multipole method, wavelet analysis and boundary element methods for

fast calculation of the electrostatic forces on macromolecules in an ionic solution. Implemented these algorithms in C++. Supervisor: Prof. Gary Huber

3/97-5/99, Postdoctoral Research Fellow, Yukawa Institute for Theoretical Physics, Kyoto University. Studied exactly solvable quantum mechanical systems and field theories. Supervisor: Prof. Ryu Sasaki

1/95-3/97, Postdoctoral Research Fellow, Department of Physics, Kyoto University. Performed research on dualities and equivalence of quantum theories. Supervisor: Prof. Taichiro Kugo

9/91-9/92, Research assistant, Department of Physics, University of Wisconsin. Analyzed data for a high-energy physics experiment using Monte Carlo programs. Supervisor: Prof. Albert Erwin

8/87-9/88, Research Associate for Northern Illinois University at Fermilab National Laboratory. Designed and tested muon chamber electronics and software for the D0 experiment and an astrophysical detector array. Supervisor: Prof. Daniel Kaplan

GRANTS AND FELLOWSHIPS

Principal Investigator, Department of Energy Phase II SBIR, 9/03-8/04, "Genomic Annotation Platform"

Department of Health and Human Services, National Research Service Award training grant, 5/02-5/03, Department of Bioengineering, University of California - San Diego

National Science Foundation/Japan Society for the Promotion of Science Postdoctoral Research Fellowship, 3/97-5/99, Yukawa Institute for Theoretical Physics

National Science Foundation/Japan Society for the Promotion of Science Postdoctoral Research Fellowship, 1/95-3/97, Department of Physics, Kyoto University

TEACHING EXPERIENCE

Total of 3 years duration, in the period 9/89-9/94, as a Teaching Assistant for the Department of Physics, University of Wisconsin. Taught recitation and laboratory sessions for various introductory physics courses and an electronics laboratory course.

3/98-10/98, Kawara Juku community school, Kyoto, Japan. Taught a course on modern physics, including relativity, quantum mechanics, and chaos theory, for the layperson in the Japanese language.

PARTICIPATION

“Analysis and Prediction of Protein-Protein Interfaces Using a Robust Method for Calculating Evolutionary Conservation”, seminar talk, University of Illinois, Chicago, IL., Aug. 23, 2004

“Fast Boundary Element Method for the Calculation of Forces on Macromolecules in an Ionic Solution” and “Accurate Electrostatic Calculations for Transfer Energies and Conformational Sampling”, American Chemical Society National Meeting, New Orleans, LA., March 23-27, 2003.

“Predicting Molecular Interactions”, International Forum 2002 on Structural Biology, Yokohama, Japan, Nov. 10-12, 2002.

Computer Aided Drug Design Summer School 2001, University of California - San Diego, Jun. 30 - Aug. 3, 2001.

Intelligent Systems in Molecular Biology 2000, University of California - San Diego, Aug. 19-29, 2000.

Quantitative Challenges in the Post-Genomic Sequence Era: A Workshop and Symposium, San Diego, CA., Jan. 11-15, 2000.

“A New Formulation of Lax Pairs for Generalized Calogero-Moser Models”, Trends in Mathematical Physics Conference, University of Tennessee, Knoxville, TN., October 14-17, 1998.

“Lax Pairs for Generalized Calogero-Moser Systems Associated with Lie Al-

gebras”, XXX Symposium on Mathematical Physics, Dynamical Systems: From Integrability to Chaos, Torun, Poland, May 26-30, 1998.

“Integrability of the Quantum Korteweg-DeVries and Quantum Boussinesq Theories from the Reduction of W_∞ and $W_{1+\infty}$ Algebras”, Third Bologna Workshop on Conformal Field Theories and Integrable Models, Bologna, Italy, October 1-4, 1997.

MEMBERSHIP

American Physical Society
American Chemical Society
Sigma Xi, The Scientific Research Society

OTHER SKILLS

Computer: C++, FORTRAN, Unix, Python, Perl, ICM, Mathematica, Monte Carlo and numerical methods.

Bioinformatics: Sequence analysis methods, Hidden Markov Models, Homology modeling, Phylogenetic analysis

Languages: Japanese (spoken and written) and French (written)

PUBLICATIONS

- 1 A.J. Bordner and R.A. Abagyan, “REVCOM: A Robust Bayesian Method for Evolutionary Rate Estimation”, *submitted for publication*.
- 2 A.J. Bordner and R.A. Abagyan, “Statistical Analysis and Prediction of Protein-Protein Interfaces”, *to appear in Proteins*.
- 3 A.J. Bordner and R.A. Abagyan, “Large-Scale Prediction of Protein Geometry and Stability Changes for Arbitrary Single Point Mutations”, *Proteins* **57** (2004) 400.
- 4 A.J. Bordner, C.N. Cavasotto, and R.A. Abagyan, “Direct Derivation of van der Waals Force Field Parameters from Quantum Mechanical Interaction Energies”, *J. Phys. Chem. B* **107** (2003) 9601.

- 5 A.J. Bordner and G.A. Huber, "Boundary Element Solution of the Linear Poisson-Boltzmann Equation and a Multipole Method for the Rapid Calculation of Forces on Macromolecules in Solution", *J. Comp. Chem.* **24** (2003) 353.
- 6 A.J. Bordner, C.N. Cavasotto, and R.A. Abagyan, "Accurate Transferable Model for Water, n-Octanol and n-Hexadecane Solvation Free Energies", *J. Phys. Chem. B* **106** (2002) 11009.
- 7 A.J. Bordner, N.S. Manton, and R. Sasaki, "Calogero-Moser Models V: Supersymmetry and Quantum Lax Pair", *Prog. Theor. Phys.* **103** (2000)
- 8 A.J. Bordner and R. Sasaki, "Generalized Calogero-Moser Models and Universal Lax Pair Operators", *Prog. Theor. Phys.* **102** (1999)
- 9 A.J. Bordner, "A New Formulation of Lax Pairs for Generalized Calogero-Moser Models", in *Trends in Mathematical Physics Proceedings*, edited by V. Alexiades and G. Siopsis, AMS and International Press, (1999) 113.
- 10 A.J. Bordner and R. Sasaki, "Calogero-Moser Models III: Elliptic Potentials and Twisting", *Prog. Theor. Phys.* **101** (1999) 799.
- 11 A.J. Bordner, R. Sasaki, and K. Takasaki, "Calogero-Moser Models II: Symmetries and Foldings", *Prog. Theor. Phys.* **101** (1999) 487.
- 12 A.J. Bordner, E. Corrigan, and R. Sasaki, "Calogero-Moser Models: A New Formulation", *Prog. Theor. Phys.* **100** (1998) 1107.
- 13 A.J. Bordner, "Commuting Charges of the Quantum Korteweg-DeVries and Quantum Boussinesq Theories from the Reduction of W_∞ and $W_{1+\infty}$ Algebras", *Mod. Phys. Lett. A* **13** (1998) 541.
- 14 A.J. Bordner, "Smooth Bosonization as a Quantum Canonical Transformation", *Phys. Rev. D* **55** (1997) 7739.

- 15 A.J. Bordner, "Operator Transformations Between Exactly Solvable Potentials and Their Lie Group Generators", *J. Phys.* **A 30** (1997) 3927.
- 16 A.J. Bordner, "Linear Canonical Transformations in Quantum Mechanics", *J. Math. Phys.* **38** (1997) 3427.
- 17 A.J. Bordner et al., "Experimental Information on the Pion Gluon Distribution Function", *Z. Für Phys.* **C 72** (1996) 249.
- 18 A.J. Bordner, "Parameter Bounds in the Supersymmetric Standard Model from Charge/Color Breaking Vacua", Kyoto Univ. preprint KUNS-1351.
- 19 T.J. Allen and A.J. Bordner, "Charged Vortex Dynamics in Ginzburg-Landau Theory of the Fractional Quantum Hall Effect", *Int. J. Mod. Phys.* **A 10** (1995) 645.
- 20 T.J. Allen, A.J. Bordner, and D.B. Crossley, "Phase Space Reduction and Vortex Statistics: An Anyon Quantization Ambiguity", *Phys. Rev.* **D 49** (1994) 6907.