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Education

Ph.D. Physics & Biochemistry, 2002, Michigan State University, East Lansing, MI.
Advisors: Michael F. Thorpe & Leslie A. Kuhn. Thesis: "Protein Rigidity and Flexibility: Applications to Folding and Thermostability."

M.S. Physics, 1998, Michigan State University, East Lansing, MI.

B.S. Physics & Mathematics, 1996, University of Houston, Houston, TX. Graduated *Summa Cum Laude* with Honors in Major and University Honors. Thesis: "Improved Efficiencies in InP/InGaAs Solar Cells by an Anti-reflection Coating Process."

Professional Experience

Assistant Professor, Department of Physics, Indiana University-Purdue University at Indianapolis, Aug. 2005 – present.

Research Associate, Department of Computational Biology, University of Pittsburgh School of Medicine, Jan. 2003 – July 2005.

Research Assistant, Department of Physics and Astronomy and Department of Biochemistry and Molecular Biology, Michigan State University, Jan. 1998 – Dec. 2002.

Teaching Assistant, Department of Physics and Astronomy, Michigan State University, 1996-1997, 2001.

Undergraduate Research Assistant, Department of Physics and Space Vacuum Epitaxy Center, University of Houston. Advisor: Alex Freundlich, Sept. 1994 – May 1996.

Undergraduate Research Assistant, Indiana University Cyclotron Facility, NSF-REU summer program. Advisors: Victor Viola and Kris Kwiatkowski, Summer 1994.

Publications

1. Lee-Wei Yang*, **A.J. Rader***, Xiong Liu, Cristopher Jon Jursa, Shann Ching Chen, Hassan Karimi and Ivet Bahar. oGNM: Online Computation of Structural Dynamics Using the Gaussian Network Model, *Nucleic Acids Research*, (in press).
2. **A.J. Rader**, Chakra Chennubhotla, Lee Wei Yang, and Ivet Bahar. The Gaussian Network Model: Theory and Applications, Chapter 3, Normal Mode Analysis: Theory and Applications to Biological and Chemical Systems, Ed. Q. Cui and I. Bahar, CRC Press, Boca Raton, (2005), 41-64.

3. Chakra Chennubhotla, **A.J. Rader**, Lee Wei Yang and Ivet Bahar. Elastic Network Models for Understanding Biomolecular Machinery: From Enzymes to Supramolecular Assemblies, *Physical Biology*, **2**, S173-S180 (2005), S173-S180
4. Ivet Bahar and **A.J. Rader**. Coarse-Grained Normal Mode Analysis in Structural Biology. *Current Opinions in Structural Biology*, **15**, (2005), 586-592.
5. L. W. Yang, X. Liu, C. J. Jursa, M. Holliman, **A.J. Rader**, H.A. Karimi, and I. Bahar, iGNM: A Database of Protein Functional Motions Based on Gaussian Network Model, *Bioinformatics*, **21**, (2005), 2978-2987.
6. **A.J. Rader**, Daniel H. Vlad, and Ivet Bahar, Maturation Dynamics of Bacteriophage HK97 Capsid, *Structure*, **13**, (2005), 413-421.
7. M.F. Thorpe, Mykyta Chubynsky, Brandon Hespenheide, Scott Menor, Donald J. Jacobs, Leslie A. Kuhn, Maria I. Zavodszky, Ming Lei, **A.J. Rader**, and Walter Whiteley, "Flexibility in Biomolecules", Chapter 6, Current Topics in Physics, Ed. R.A. Barrio and K.K. Kaski, Imperial College Press, London (2005), 97-112.
8. Mykyta Chubynsky, Brandon Hespenheide, Donald J. Jacobs, Leslie A. Kuhn, Ming Lei, Scott Menor, **A.J. Rader**, M.F. Thorpe, Walter Whiteley, and Maria I. Zavodszky, Constraint Theory applied to Proteins *to be published in the Proceedings of the Indo-US workshop*, 2004 by Nova Publishers.
9. Yongmei Wang, **A.J. Rader**, Ivet Bahar, and Robert L. Jernigan, Global Ribosome Motions Revealed with Elastic Network Model, *Journal of Structural Biology* **147**(3), (2004), 302-314.
10. **A.J. Rader**, Gülsüm Anderson, Basak Isin, H. Gobind Khorana, Ivet Bahar and Judith Klein-Seetharaman, Identification of Core Amino Acids Stabilizing Rhodopsin, *Proceedings of the National Academy of Sciences (USA)* **101**(19), (2004), 7246-7251.
11. **A.J. Rader** and Ivet Bahar, Folding Core Predictions from Network Models of Proteins, *Polymer* **45**(2), (2004), 659-668.
12. Brandon M. Hespenheide, **A.J. Rader**, M.F. Thorpe, and Leslie A. Kuhn, Identifying Protein Folding Cores from the Evolution of Flexible Regions during Unfolding, *Journal of Molecular Graphics & Modelling* **21**, (2002), 195-207.
13. **A.J. Rader**, Brandon M. Hespenheide, L.A. Kuhn, and M.F. Thorpe, Protein Unfolding: Rigidity Lost, *Proceedings of the National Academy of Sciences (USA)* **99**, (2002), 3540-3545.
14. D.J. Jacobs, **A.J. Rader**, Leslie A. Kuhn, and M.F. Thorpe, Protein Flexibility Predictions Using Graph Theory, *PROTEINS: Structure, Function and Genetics* **44**, (2001), 150-165 (***cover figure**).
15. M.F. Thorpe, Ming Lei, **A.J. Rader**, Donald J. Jacobs and Leslie A. Kuhn, Protein Flexibility and Dynamics using Constraint Theory, *Journal of Molecular Graphics & Modelling* **19**, (2001), 60-69.
16. M.F. Thorpe, D.J. Jacobs, N.V. Chubynsky and **A.J. Rader**, Generic Rigidity of Network Glasses in Rigidity Theory and Applications, Edited by M.F. Thorpe and P.M. Duxbury. Kluwer Academic/Plenum Publishing, New York (1999) 239-277.

17. D.S. Bracken, K. Kwiatkowski, K.B. Morley, E. Renshaw Foxford, K. Komisarck, **A.J. Rader** and V.E. Viola, Charging Effects in Passivated Silicon Detectors, *Nuclear Instruments and Methods in Physics Research A* **365**, (1995) 424-426.

Invited & Contributed Talks

1. A.J. Rader, "Models for Oligonucleotides in FIRST and FRODA" Arizona State University, Tempe, AZ, December 2, 2005.
2. A.J. Rader, "Functional Motions of Biomolecular Structures Predicted by Elastic Network Models" Indiana University-Purdue University Indianapolis, Center for Computational Biology and Bioinformatics, Indianapolis, IN, October 14, 2005.
3. A.J. Rader, "Large-scale Motions of the Ribosome" Indiana University-Purdue University Indianapolis, Department of Physics, Indianapolis, IN, September 9, 2005.
4. A.J. Rader, "Prediction of Folding Core Residues in G-Protein-Coupled Receptors" Midwest Protein Folding Conference, University of Notre Dame, Department of Physics, Notre Dame, IN, April 2, 2005.
5. A.J. Rader, "Protein Flexibility, Dynamics, and Folding: Insights from Network Models" Indiana University Purdue University at Indianapolis, Department of Physics, Indianapolis, IN, March 31, 2005.
6. A.J. Rader, "Protein Flexibility, Dynamics, and Folding: Insights from Network Models" University at Buffalo, SUNY, Department of Physics, Buffalo, NY, March 3, 2005.
7. A.J. Rader, "Protein Flexibility, Dynamics, and Folding: Insights from Network Models" University of Pittsburgh, Department of Computational Biology, Pittsburgh, PA, January 24, 2005.
8. A.J. Rader, "Protein Conformation Pathway Generation Using Iterative Elastic Network Models" 2nd Biological Language Conference, Carnegie Mellon University and University of Pittsburgh, Pittsburgh, PA, November 18-19, 2004.
9. A.J. Rader, "Simulating Viral Capsid Maturation Using Elastic Network Models" Computational Methodology in Modeling Complex Biological Systems Workshop, Pittsburgh Center for Biomedical Computation, Pittsburgh, PA, October 13, 2004.
10. A.J. Rader, "Protein Folding Predictions from Network Models" Condensed Matter & Biological Physics Seminar, Department of Physics, Syracuse University, Syracuse, NY, September 24, 2004.
11. A.J. Rader, "Modeling of Bigger Biomolecules & Assemblies" Workshop on Modeling Protein Stability, Flexibility and Motions, Banff, Alberta, Canada, July 17-22, 2004.
12. A.J. Rader, "FIRST and Protein Unfolding" Workshop on Modeling Protein Stability Flexibility and Motions, Banff, Alberta, Canada, July 17-22, 2004.
13. A.J. Rader, "Perspectives on Protein (un)Folding from Rigidity" American Mathematical Society 2004 Spring Eastern Section Meeting, Rider University, Lawrenceville, NJ, April 17, 2004.
14. A.J. Rader, Yongmei Wang, Ivet Bahar, and Robert L. Jernigan, "Motions and Deformations in Ribosome" Biophysical Society 48th Annual Meeting, Baltimore, MD, February 16, 2004.

15. A.J. Rader, "Extensions of FIRST to Nucleotides" Arizona State University, Tempe, AZ, January 30, 2004.
16. A.J. Rader, Gülsüm Anderson, Basak Isin, Judith Klein-Seetharaman, and Ivet Bahar, "The Folding Core in Rhodopsin" Biological Language Conference, Carnegie Mellon University and University of Pittsburgh, Pittsburgh, PA, November 20-21, 2003.
17. A.J. Rader, "Protein Rigidity and Flexibility: Applications to Folding" 2nd Biological Language Modeling Workshop, Carnegie Mellon University, Pittsburgh, PA, May 14, 2003.
18. A.J. Rader, Brandon M. Hesperheide, Leslie A. Kuhn, M.F. Thorpe, "Protein Unfolding: Rigidity Lost" American Physical Society March Meeting, Austin, TX, March 4, 2003.
19. A.J. Rader, "Protein Rigidity and Flexibility: Applications to Folding and Thermostability" T-10 Theoretical Biology & Biophysics Division, Los Alamos National Laboratory, Los Alamos, NM, October 15, 2002.
20. A.J. Rader, "Protein Rigidity and Flexibility: Applications to Folding and Thermostability" Center for Computational Biology & Bioinformatics, University of Pittsburgh, Pittsburgh, PA, October 4, 2002.
21. A.J. Rader, "Protein Unfolding: Rigidity Lost" Condensed Matter Physics Brown Bag Seminar, Department of Physics & Astronomy, Michigan State University, East Lansing, MI, September 27, 2001.
22. A.J. Rader, "The Protein Folding Problem" Condensed Matter Physics Brown Bag Seminar, Department of Physics & Astronomy, Michigan State University, East Lansing, MI, October 12, 2000.
23. A.J. Rader, D.J. Jacobs, and M.F. Thorpe, "Computational Analysis for Random Bond Model Rigidity Percolation" American Physical Society Centennial Meeting, Atlanta, GA, March 26, 1999.
24. A.J. Rader, K. Kwiatkowski, and V.E. Viola, "Leakage Current Effects in Passivated Silicon Detectors" 5th Annual Argonne Symposium for Undergraduates in Science, Engineering, and Mathematics. Argonne National Laboratory, Argonne, IL, November 4-5, 1994.

Posters

- A.J. Rader and Ivet Bahar, *Protein Conformational Changes Illustrated by Iterative Elastic Network Analysis* Poster at Biophysical Society 50th Annual Meeting, Salt Lake City, UT, February 2006.
- A.J. Rader, Daniel H. Vlad, Yongmei Wang and Ivet Bahar, *Elastic Network Models Reveal Maturation Dynamics of Bacteriophage HK97* Poster at Biophysical Society 49th Annual Meeting, Long Beach, CA, February 2005.
- A.J. Rader, Gülsüm Anderson, Basak Isin, Judith Klein-Seetharaman, and Ivet Bahar *The Folding Core of the G-Protein-Coupled Receptor Rhodopsin* Poster at Biophysical Society 48th Annual Meeting, Baltimore, MD, February 2004.
- A.J. Rader and Ivet Bahar *Folding Core Predictions from Network Models of Proteins* Poster at 35th Central Regional Meeting of the American Chemical Society, Pittsburgh, PA, October 2003.

- A.J. Rader, Basak Isin, Gülsüm Anderson, Judith Klein-Seetharaman, and Ivet Bahar *The Folding Core of the G-Protein-Coupled Receptor Rhodopsin* Poster at Science 2003, University of Pittsburgh, Pittsburgh, PA, September 2003.
- A.J. Rader and Ivet Bahar *Folding Core Predictions from Network Models of Proteins* Poster at UB-SUNY 1st Frontiers in Bioinformatics Symposium, Buffalo, NY, June 2003.
- A.J. Rader, B.M. Hesperheide, L.A. Kuhn, and M.F. Thorpe, *Protein Unfolding Driven by Changing Mean Coordination* Poster at the Protein Society Symposium, San Diego, CA, August 2002.
- A.J. Rader, B.M. Hesperheide, L.A. Kuhn, and M.F. Thorpe, *Protein Unfolding Driven by Changing Mean Coordination* Poster at the MSU Center for Biological Modeling Annual Symposium, East Lansing, MI, June 2002.
- A.J. Rader, B.M. Hesperheide, L.A. Kuhn, and M.F. Thorpe, *The Mean Coordination, $\langle r \rangle$, as a Protein Folding Reaction Coordinate* Poster at the 16th Annual MSU Center for Fundamental Materials Research Symposium, East Lansing, MI, April 2002.
- A.J. Rader, B.M. Hesperheide, L.A. Kuhn, and M.F. Thorpe, *Protein Unfolding: Rigidity Lost?* Poster at the Center for Biological Modeling Annual Retreat, Augusta, MI, May 2001.
- A.J. Rader, L.A. Kuhn, B.M. Hesperheide and M.F. Thorpe; *Protein Unfolding: An Example of a Rigid--Floppy Phase Transition* Poster at the 15th Annual CFMR Symposium, MSU, East Lansing, MI, March 26, 2001.
- A.J. Rader, L.A. Kuhn, B.M. Hesperheide and M.F. Thorpe; *The Transition Between Rigidity and Flexibility in Proteins and Glasses* Poster at the MSU sponsored Protein Flexibility & Folding Workshop, Traverse City, MI, August 13-17, 2000.
- A.J. Rader, L.A. Kuhn, and M.F. Thorpe; *Computational Detection and Analysis of Proteins Flexibility* Poster at the 14th Annual CFMR Symposium, MSU, East Lansing, MI, February 2000.
- A.J. Rader, L.A. Kuhn, and M.F. Thorpe *Prediction of Protein Flexibility* Poster at LJIS Quantitative Challenges in the Post-Genomic Sequence Era: Workshop and Symposium, San Diego, CA, January 2000.
- A.J. Rader and M.F. Thorpe *Ligand Binding Effects on Protein Rigidity and Flexibility* Poster at the 47th Annual Midwest Solid State Conference, Ohio University, Athens, OH, September 1999.
- A.J. Rader, D.J. Jacobs, M.F. Thorpe, & L.A. Kuhn *Rigid and Flexible Regions in Proteins* Poster at the 13th Annual CFMR Symposium, MSU, East Lansing, MI, 1999.
- N.V. Chubynsky, A.J. Rader, D.J. Jacobs and M.F. Thorpe *Bethe Lattice Model of Rigidity Percolation in Glasses* Poster (co-presented with N.V. Chubynsky) at the 46th Annual Midwest Solid State Conference, Iowa State University, Ames, IA, 1998.

Honors and Awards

- Young Investigator's Scholarship, University of Buffalo-SUNY Frontiers in Bioinformatics Symposium, 2003
- Thomas Kaplan Award for best CMP Graduate Research Presentation, Michigan State University Physics Dept., 2001–2002
- Center for Biological Modeling Graduate Award, Michigan State University, 2000 & 2001
- Herbert T. Graham Scholarship, Michigan State University, 1998

- Arete Award (outstanding senior thesis), University of Houston, 1996
- H. Gordon and Bernice Davis Memorial Scholarship, University of Houston, 1995–1996
- National Merit Scholar, University of Houston, 1992–1996

Computational Skills

- Experience with programming languages: FORTRAN, C/C++, perl, Matlab, HTML, and LaTeX.
- I helped write, maintain and update the source code for the FIRST software (<http://www.bch.msu.edu/labs/kuhn/web/projects/first/home.html>) and its web version: <http://flexweb.asu.edu>.
- I helped develop and maintain the *i*GNM database, its web-server (<http://ignm.cccb.pitt.edu>) and online calculation engine: oGNM.
- Experience with molecular modeling and dynamics software: rasmol, InsightII, VMD, PyMol, NAMD, and MOIL.

Professional Affiliations & Service

American Physical Society, Biophysical Society & Protein Society

Reviewer for Journal of Physical Chemistry, Biophysical Journal, and Journal of Biomolecular Structure & Dynamics