CURRICULUM VITÆ

Name: Raymond Dean Astumian
Professor of Physics
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Place and Date of Birth: Birmingham, Alabama October 3, 1956

Citizenship: United States

Family Status: Married to Mary Whalen, two children (Judith Louise 1997, and Joseph Dean 1999)

Current Address: 19 Edgewood Drive
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Education:

- B.S. (Chemistry), University of Texas, Arlington 1978
- M.S. (Chemistry), The University of Texas at Arlington 1982 Thesis: "Relaxation Kinetics of Adsorption-Desorption of Proton on Iron Oxides in Aqueous Suspension" (Research Advisor – Z.A. Schelly)
- Ph.D. (Mathematical Science/Physical Chemistry), 1983 The University of Texas at Arlington Dissertation: "Geometric Effects and Reduction of Dimensionality at Interfaces and in Electric Fields" (Research Advisor – Z.A. Schelly)

Academic appointments:

- 01/01- Professor, Department of Physics, The University of Maine
- 7/99-12/00 Associate Professor (with tenure), Departments of Surgery and of Biochemistry and Molecular Biology, and the College, The University of Chicago
- 10/92-6/99 Assistant Professor, Departments of Surgery and of Biochemistry and Molecular Biology, and the College, The University of Chicago
- 6/88-9/92 Bioprocess Metrology Group, Center for Chemical Technology, National Institute of Standards and Technology
- 9/84-6/88 Staff Fellow, Laboratory of Biochemistry, National Heart, Lung, and Blood Institute, National Institutes of Health

Awards and Other Scientific Recognition:

- 1984 Sigma Xi Doctoral Research Award
- 1987 Galvani Prize of the Bioelectrochemical Society
- 11/89-4/90 Visiting Professor, Bielefeld University, Bielefeld, Germany
- 04/00-07/00 Senior Fellow, Collegium Budapest, Hungary
- Distinguished Alumnus, University of Texas, Arlington (2000)
- Fellow of the American Physical Society, Elected 2000
- Professor Invite', Universite' Louise Pasteur et Institute de Science et d'Ingenierie Supramoleculaires, Strasbourg, France June - August 2005
- Visiting Scholar, Ludwig Maximillian University, Munich, Germany, May-June, 2006
- Finalist for the 2008 Feynman prize for Theory in Nanotechnology awarded by the Foresight Institute
- Humboldt Research Award, 2009

Professional Service:

- Editorial Board, Biophysical Journal, 2009-2011
- Editorial Board, Bioelectrochemistry and Bioenergetics, 1992-2002
- Proposer (with Heiner Linke and Peter Hanggi) and member of the Scientific Advisory Committee, Nobel Symposium on Controlled Nanoscale Motion in Biological and Artificial Systems, Sweden, June 13-17, 2005
- Elected as vice-chair of the Division of Biological Physics, American Physical Society (2005); served as vice-chair (March 2005-March 2006); Chair-elect (March 2006-March 2007); Chair (March 2007-2008); Past Chair (March 2008-March 2009)

Refereed Publications:

[1] R.D. Astumian, M. Sasaki, T. Yasunaga, and Z.A. Schelly. Proton Adsorption-Desorption Kinetics on Iron Oxides in Aqueous Suspensions Using the Pressure-Jump Method. *J. Phys. Chem.* **85**: 3832-3835 (1981).

[2] T. Ikeda, M. Sasaki, R.D. Astumian, and T. Yasunaga. Kinetics of the Hydorlysis of Zeolite 4A Surface by the Pressure-Jump Relaxation Method. *Bull. Chem. Soc. Jpn.* **54**: 1885-1886 (1981).

[3] T. Ikeda, M. Sasaki, K. Hachiya, R.D. Astumian, T. Yasunaga, and Z.A. Schelly. Adsorption-Desorption Kinetics of Acetic Acid on Silica-Alumian Particles in Aqueous Suspensions Using the Pressure-Jump Relaxation Method. *J. Phys. Chem.* **86**: 3861-3866 (1982).

[4] N. Mikami, M. Sasaki, K. Hachiya, R.D. Astumian, T. Ikeda, and T. Yasunaga. Kinetics of the Adsorption-Desorption of Phosphate on (-AL2O3 Surface Using the Pressure-Jump Technique. *J. Phys. Chem.* **87**: 1454-1458 (1983).

[5] M. Sasaki, M. Moriya, T. Yasunaga, and R.D. Astumian. A Kinetic Study of Ion-Pair Formation on the Surface of (β-FeOOH in Aqueous Suspensions Using the Electric Field Pulse Technique. *J. Phys. Chem.* **87**: 1449-1453 (1983).

[6] Z.A. Schelly and R.D. Astumian. A Theory for the Apparent "Negative Second Wien Effect" Observed in Electric Field-Jump Studies of Suspensions. *J. Phys. Chem.* **88**: 1152-1156 (1984).

[7] R.D. Astumian and Z.A. Schelly. Geometric Effects of Reduction of Dimensionality in Interfacial Reactions. *J. Amer. Chem. Soc.* **106**: 304-308 (1984).

[8] R.D. Astumian and P.B. Chock. Interfacial Reaction Dynamics. *J. Phys. Chem.* **89**; 3477-3482 (1985).

[9] R.D. Astumian and Z.A. Schelly. Explicit Inclusion of the Excluded Volume in the Formula for Diffusion Controlled Dissociation Rate Constants. *J. Phys. Chem.* **90**: 537-538 (1986).

[10] T.Y. Tsong and R.D. Astumian. Absorption and Conversion of Electric Field Energy by Membrane Bound ATPases. *Bioelec. Bioenerg.* **211**: 457-476 (1986).

[11] H.V. Westerhoff, T.Y. Tsong, P.B. Chock, Y.D. Chen, and R.D. Astumian. How Enzymes Can Capture and Transmit Free Energy Contained in an Oscillating Electric Field. *Proc. Natl. Acad. Sci. U.S.A.* **83**: 4734-4738 (1986).

[12] R.D. Astumian, P.B. Chock, T.Y. Tsong, Y. Chen, and H.V. Westerhoff. Can Free Energy Be Transduced From Electrical Noise? *Proc. Natl. Acad. Sci. U.S.A.* **84**: 434-438 (1987).

[13] R.D. Astumian, P.B. Chock, and T.Y. Tsong. Absorption and Conversion of Energy from Dynamic Electric Fields by Membrane Proteins: Electro-conformational Coupling. *Studia Biophysica* **119**: 123-130 (1987).

[14] F. Kamp, R.D. Astumian, and H.V. Westerhoff. Coupling of Vectorial Proton-Flow to a Biochemical Reaction by Localized Electric Interactions. *Proc. Natl. Acad. Sci. U.S.A.* **85**: 3792-3796 (1988).

[15] D.B. Kell, R.D. Astumian, and H.V. Westerhoff. Mechanisms for the Interaction between Nonstationary Electric Fields and Biological Systems. I. Linear Dielectric Theory and Its Limitations. *Ferroelectrics* **86**: 59-78 (1988).

[16] H.V. Westerhoff, R.D. Astumian, and D.B. Kell. Mechanisms for the Interaction between Nonstationary Electric Fields and Biological Systems. II. Nonlinear Dielectric Theory and Free Energy Transduction. *Ferroelectrics* **86**: 79-101 (1988).

[17] H.V. Westerhoff, D.B. Kell, and R.D. Astumian. The Dynamics of Electrostatic Interactions Between Membrane Proteins, *J. Electrostatics* **21**: 257-298 (1988).

[18] R.D. Astumian, P.B. Chock, T.Y. Tsong, and H.V. Westerhoff. Effects of Energy Driven Oscillations and Fluctuations on the Dynamics of Enzyme Catalysis. *Phys. Rev. A* **39**: 6416-6435 (1989).

[19] T.Y. Tsong, D.S. Liu, F. Chauvin, A.K. Gaigalas, and R.D. Astumian. Protein Electroconformational Coupling (ECC): An Electric Field Enforced Enzyme Oscillation for Cellular Energy and Signal Transduction. *Bioelec. Bioenerg.* **21**: 319-331 (1989).

[20] R.D. Astumian and B. Robertson. Nonlinear Effect of an Oscillating Electric Field on Membrane Proteins. *J. Chem. Phys.* **91**: 4891-4901 (1989).

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[32] J.C. Weaver and R.D. Astumian. Estimates for ELF Effects: Noise-Based Thresholds and the Number of Experimental Conditions Required for Empirical Searches. *Bioelectromag. Suppl.* **1**: 119-138 (1992).

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[75] Astumian, R.D., Biasing the Random Walk of a Molecular Motor, *J. Phys.: Condens. Matter* **17**: S3753-S3766 (2005).

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[89] Astumian, R.D., Thermodynamics and Kinetics of Molecular Motors, *Biophys. Journal*, **98**: 2401-2409 (2010).

Major Reviews:

- T.Y. Tsong and R.D. Astumian. Electro-Conformational Coupling and Membrane Protein Function. Prog. Biophys. Mol. Biol. 50: 1-45 (1987).
- T.Y. Tsong and R.D. Astumian. How Transport ATPases Use Electric Field Energy. Annu. Rev. Physiol. 50: 273-290 (1988).
- T.Y. Tsong, D.S. Liu, F. Chauvin, and R.D. Astumian. Resonnance Electroconformational Coupling: A Proposed Mechanism for Energy and Signal Transduction by Membrane Proteins. Biosc. Rep. 9: 13-26 (1989).
- R.C. Lee and R. Dean Astumian, The Physicochemical basis for thermal and non-thermal 'burn' injuries, Burns 22:509-519 (1996).
- R. Dean Astumian, Body Works, New Scientist 38-41, December 13, (1997).
- R. Dean Astumian, Making Molecules Into Motors, Scientific American, July 2001
- R. Dean Astumian and P. Hanggi, Brownian Motors, Physics Today, Nov. 2002
- R. Dean Astumian, Thermodynamics and Kinetics of Molecular Motors, Biophys. Journal, 98: 2401-2409 (2010).

Selected Invited Lectures since 2000:

- University of Maryland, Physics Colloquium, Oct. 2001
- Harvard University, Joint Harvard/MIT Physical Chemistry Seminar, Cambridge, Mass. , Oct. 2001
- University of Oregon Physics Colloquium, Eugene, Oregon, April 2002
- Princeton Plasma Physics lab, October 2003
- University of Colorado, Dept. of Mathematical Sciences, Nov. 2003
- Public Lecture, Telluride Science Research Center, Telluride, Colorado, July 2003
- Dept. of Mathematics, Carnegie Mellon University, September, 2004

- Chemistry Colloquium, University of California, Irvine, November, 2004
- Biocomplexity institute colloquium, University of Indiana, November, 2004
- Chemistry Colloquium, University of Arizona, December, 2004
- Los Alamos National Laboratory, Los Alamos, New Mexico, February, 2005
- University of Missouri, Columbia, Missouri, May, 2005
- California Nanosystem Institute Colloquium, Univ. California, Los Angeles, May 2005
- Institute of Supramolecular Science and Engineering, Strasbourg, France, July, 2005
- Physics Colloquium, University of Rhode Island, Kingston, RI Sept. 2005
- Sommerfeld Colloquium, Ludwig Maximillian University, Munich, Germany, May, 2006.
- Dept. of Chemistry, University of Edinburgh, Edinburgh, Scotland, June, 2006.
- Physical Chemistry Seminar, University of Californian, San Diego, San Diego, CA, Oct. 2006.
- Biochemistry and Molecular Biology Colloquium, University of Southern California, Los Angeles, CA, Oct. 2006.
- Dept. of Physics, Univ. of Illinois, Chicago, Sept. 2007
- Dept. of Physics, SUNY Buffalo, New York, Oct. 2007
- Dept. of Chemistry,Tufts University, Boston, Oct. 2008
- Dept. of Physics, Southern Florida University, Tampa, March 2009

Invited Lectures at Major National and International Symposia (since 2000):

- Invited Speaker, Royal Society Discussion Meeting on "The molecular physics of biological movement", 14-15 April 1999, London, England.
- Workshop on Biophysical Motility, Budapest, Hungary, June, 2000
- year 2000 Marion Smoluchowski Symposium, Zakopane, Poland, September 2000
- Biophysics of the Cytoskeleton, Banff, Canada, September, 2000
- "Dynamics Days", Charlotte, North Carolina, January, 2001
- APS March Meeting, Seattle, Washington, March 12-16, 2001

- Gordon Conference on Nonlinear Science, Mt. Holyoak, Massachusetts, July 17-22, 2001
- Gordon Conference on Bioelectrochemistry, Mt. Holyoak, Massachusetts, June, 2002
- PASI workshop on New Challenges in Statistical Mechanics, Bariloche, Argentina, June, 2002
- Aspen Physics Center Conference, Single Molecule Biophysics, January, 2003
- Telluride Science Research Center Conference, Chemistry and Dynamics in Complex Environments, June, 2003
- Telluride Science Research Center Conference, Protein Dynamics, July, 2003
- Aspen Physics Center Conference, Functional integration of nanoscale devices, January, 2004
- Chemistry and Physics of Multifunctional Materials: From Clever Molecules to Smart Materials, Tomar, Portugal September, 2004
- Keck Futures meeting, Designing Nanostructures at the Interface Between Biomedical and Physical Systems, Irvine, California November, 2005
- Aspen Physics Center Conference, Single Molecule Biophysics, January, 2005
- PASI workshop on Bioinspired nanoscience and molecular machines, Bariloche, Argentina, March, 2005
- Nobel Symposium 131, Controlling Motion at the Nanoscale, June, 2005
- 100 Years of Brownian Motion, Ettora Marjorana Center, Erice, Sicily (Italy), Aug. 2005
- Plenary Lecture, Einstein Symposium of the New England Section, APS, Colgate College, Hamilton, New York, October, 2005
- Invited Lecture, Biocomp 2005, Vietri Sul Mare, Amalfi, Italy, December 2005
- Invited Lecture, Centenial Marian Smoluchowski Symposium, Krakow, Poland, May 2006
- Lecturer, Les Houches Summer School on Molecular Motors, Les Houches, France, June, 2006.
- Invited Talk, Newton Institute Workshop on First Passage and Extreme Value Problems, Cambridge, England, June 26-31, 2006.
- Invited Lecture, Biocomp 2007, Vietri Sul Mare, Amalfi, Italy, September 2007.

- Invited, 21st Solvay Conference on Chemistry, Brussels, Belgium, Nov. 29-Dec. 1, 2007.
- Invited Talk, APS March Meeting 2008, New Orleans, LA , March 2008.
- Invited Talk, ACS Fall Meeting 2008, Philadelphia, PA , August 2008.
- Invited Talk, APS March Meeting 2009, Pittsburgh, PA , March 2009.
- Invited Talk, ACS Spring Meeting 2009, Salt Lake City, Utah , March 2009.

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