

# ROBERT S. EISENBERG

*Curriculum Vitae*

October 2, 2005

## ***Work co-ordinates***

### *Address*

Department of Molecular Biophysics and Physiology  
Rush Medical College  
1750 West Harrison, Room 1291 Jelke  
Chicago IL 60612

### *Phone numbers*

Voice: (312)-942-6467  
Dept FAX: (312)-942-8711  
Skype Phone Number (708) 459-8089  
Email: beisenbe@rush.edu

### *Web Sites*

Departmental Site: <http://www.rushu.rush.edu/molbio/>  
with a 'Chairman's Message' at <http://www2.phys.rush.edu/physiomsg.html>  
leading to Personal Site <http://www2.phys.rush.edu/RSEisenberg/physioeis.html>

**PNP Online** <http://www.pnponline.org/> Interactive software for running Poisson Nernst Planck theory, with Duan Chen, Wolfgang Nonner, Uwe Hollerbach, Brice Burgess, See-Wing Chiu

### *FTP Sites*

User *molebio* on <ftp.rush.edu>, password 9426454  
*PNP* in various flavors is in */pub/Eisenberg/PNP*, */pub/Eisenberg/Hollerbach*,  
*/pub/Eisenberg/Nonner*  
Files of single channel currents with noise are in */pub/Eisenberg/Noise*

## ***Education***

Elementary School: New Rochelle, New York

High School, 1956-59. Horace Mann School, Riverdale, New York City, graduated in three years with honors and awards in Biology, Chemistry, Physics, Mathematics, Latin, English and History.

Undergraduate, 1959-62. Entered Harvard College with Advanced Placement as a sophomore, concentrated in Biochemical Sciences, Prof. J.T. Edsall tutor; mentor in Physiology Prof. J.R. Pappenheimer; graduated in three years A.B., summa cum laude.

Summer work, 1960-61. Nerve Muscle Program at Marine Biological Laboratory directed by Prof. S.W. Kuffler.

Doctoral work: University College London 1962-65 (Ph.D. in Biophysics: B. Katz, Chairman); Supervisor, P. Fatt; External Examiner, A.L. Hodgkin. Mentor (over several decades): A.F. Huxley.

## ***Personal***

### *Home co-ordinates:*

Address: 7320 Lake Street, Unit 5, River Forest IL 60305

Phone: (708)-366-6332

Personal FAX: (801)-504-8665 and also (775)-256-9463

Born in Brooklyn, New York, April 25, 1942: Citizen of the United States.

Social Security Number 075-xx-xxxx.

Married Ardyth Eisenberg, 1991.

Children (mother, Brenda Russell):

Benjamin Russell Eisenberg, born March 17, 1969.

Grandchild: Crystal Lynn Moutoussamy, born March 19, 1994

Emily Ruth Eisenberg, born February 8, 1973.

Jill Anna Trowbridge (formerly Eisenberg), born November 7, 1974.

Grandchildren: James Louis Trowbridge, born August 15, 1997.

Holly Sophia Trowbridge, born July 11, 2000.

Henry Samuel Trowbridge, born January 15, 2004.

Sally Lynn Eisenberg, born June 20, 1979.

## ***Academic Positions***

Associate, 1965-1968. Department of Physiology, Duke University, Chairman: D. Tosteson. Post-doctoral fellow of P. Horowicz, along with P. Gage, C. Armstrong, etc.

Assistant Professor, 1968-1970. Department of Physiology, University of California at Los Angeles, Chairman: W. Mommaerts.

Associate Professor, 1970-75. Department of Physiology, University of California at Los Angeles.

Professor of Biomathematics and Physiology, 1975-76, University of California at Los Angeles.

Chairman of Physiology, 1976-1995. Chairman of Department of Physiology and holder of the Endowed Chair "The Francis and Catherine Bard Professor", Rush Medical College, Chicago, Illinois.

Chairman of Molecular Biophysics and Physiology 1995- present. holder of the Endowed Chair "The Francis and Catherine Bard Professor", Rush Medical College, Chicago, Illinois.

Visiting Scientist, 1991-1995. Department of Physics, Brookhaven National Laboratory, Upton, Long Island, NY.  
 Visiting Professor, 2000-2003 Computational Electronics, Beckman Institute, University of Illinois, Urbana Champaign  
 Schlumberger Visiting Professor, University of Cambridge (UK) 2002  
 Visiting Fellow, Corpus Christi College, University of Cambridge (UK) 2002-3

### ***Honors***

Editorial Board, Journal of General Physiology, 1970-1991  
 Editorial Board, Journal of Computational Electronics, 2001-...  
 Associate Editor, Comments on Theoretical Biology, 1987- ..  
 Associate Editor, News in Physiological Sciences, 1988-1992  
 Harvard College Scholarship  
 A.B. received *summa cum laude*  
 Phi Beta Kappa: member of “Senior Sixteen”  
 L.J. Henderson award for thesis in Biochemical Sciences  
 Senior Common Room Award for “Most Promising Scholar”  
 Schlumberger Visiting Professor, University of Cambridge (UK)  
 Visiting Fellow, Corpus Christi College, University of Cambridge (UK)  
 Schlumberger Medal, Physical Chemistry  
 Plenary Lecture at European Mathematics Society/AMAM 2003  
 Member Executive Board, American Physical Society (2002-2004)  
 Fellow, American Physical Society (Division of Biological Physics)  
 Argonne National Laboratory: Director’s Seminar

### ***Grant Support***

Continuous Grant Support (without interruption) thanks to a combination of NSF, NIH, and DARPA grants from approximately 1970 to present. Miscellaneous additional grants from AHA, MDA, Chicago Heart, etc.

### ***Scientific Administration***

#### AMERICAN PHYSICAL SOCIETY

Councilor (First term: 2000-2004)  
 Councilor (Second term: 2005-2009)  
 Member of Executive Board (2002-2004)  
 Member, Committee on Committees (2003- ...)  
 Member, Audit Committee (2004 - ...)

#### Division of Biological Physics

Member of Executive Board, Div Biological Physics (2001- ...)

BIOPHYSICAL SOCIETY

Member of U.S. National Committee International Union of Pure and Applied Biophysics (1978-1983)

Member of Council (1983-1986).

Member of Executive Board (1983-1986).

Member of Program Committee (1984).

Chairman of Nominating Committee (1985).

Chairman of Science Public Policy Committee (1985-1987).

CHICAGO CHAPTER OF SOCIETY FOR NEUROSCIENCE

Member of Council (1981-1984), Meeting Organizer, then President.

CHICAGO HEART ASSOCIATION

Member, Vice Chairman, then Chairman of the Research Council (1982-1986).

Member, Vice Chairman, then Chairman of Research Review Committee (1976-1986; 1989).

NATIONAL INSTITUTES OF HEALTH

Member (1979-1981), then Chairman (1981-1983) of Physiology Study Section.

Member *ad hoc* (2004) Modeling and Analysis of Biological Systems (MABS) Study Section.

NATIONAL SCIENCE FOUNDATION

Member, Steering Committee on Biology and Mathematics (1989, 1996).

PENNSYLVANIA MUSCLE INSTITUTE

Member (1980-1982; 1989-1990), then Chairman (1982-1987; 1989-1990) of the External Advisory Board, University of Pennsylvania, Director: A. Somlyo (1980-1987); Y. Goldman (1989-1990).

SOCIETY OF GENERAL PHYSIOLOGISTS

Councilor; Chairman, Membership Committee.

UNIVERSITY OF MIAMI

External review of Graduate Program, Department of Physiology (1988).

***Invited Lectures***

Albert Einstein College of Medicine

American Chemical Society, Division of Physical Chemistry

American Heart Association

AMA Institute (1966)

American Physical Society Annual Meeting, 2000

American Chemical Society Meeting, San Francisco, 2000

American Physiological Society Meeting: 1978, 1979, 1983

Argonne National Laboratory: Director's Seminar

Association of Chairmen of Departments of Physiology

Australian National University (Canberra)

Baylor University  
 Biological Chemists of the Federal Republic of Germany  
 Biophysical Society, 1991: in Symposium on Ion Channels in Intracellular Membranes  
 Biozentrum (Basel, Switzerland): Minicourse on Electrophysiology  
 Biozentrum (Basel, Switzerland): Selectivity in Channels (Seminar in Structural Biology)  
 Boston University (Department of Mathematics)  
 Brandeis University (Biochemistry)  
 Brigham Young University (Zoology)  
 Brookhaven National Laboratory (Department of Physics)  
 California Institute of Technology (Biology)  
 California Institute of Technology (Applied Mathematics)  
 Cambridge University (England) Physiology: Foster Club  
 Cambridge University (England) Chemistry, in the “Lennard Jones Lecture Series”  
 Cambridge University (England) Pharmacology  
 Cambridge (England): Schlumberger Lecture, 2002  
 Cambridge University (England) Centre for Computational Chemistry  
 CCNY, Dept of Physics  
 Centro de Investigacion y de Estudios del Avanzados (Mexico City)  
 Chicago Heart Association Cardiovascular Research Forum  
 Chicago Medical School  
 City of Hope, Duarte, California  
 K.S. Cole Symposium (FASEB, 1974)  
 Colorado State University (Dept. of Chemistry)  
 Columbia University, Dept of Chemical Engineering  
 Conference on Fluctuations, Escape, and Optimal Control Traverse City MI  
 Conference of N.Y. Academy of Science, 1977  
 Cornell University Medical School: Department of Physiology  
 Cornell University: Dept of Chemistry  
 Courant Institute (NYU) Seminar “Mostly Biomathematics” (2004)  
 DARPA (Defense Advanced Research Projects Agency)  
     Many workshops.  
     Director’s Seminar, 2001  
 DSRC (Defense Sciences Research Council) Workshop on Biosensors  
 DuPont Experimental Station  
 European Mathematics Society: Plenary Lecture at AMAM 2003 (Applied Math ...)  
 Participant (not speaker) at EMBO Meeting in honor of retirement of Max Perutz at Kings  
     College, Cambridge, 1980  
 Emory University  
 Fine Structure Society (Rosemont IL 1995)  
 Florida State University: Inaugural Workshop for Computational Science, 2000  
 FOCUS 2000, DARPA workshop, Session Leader, Speaker, Plenary Session  
 Gordon Conference on Smooth Muscle, 1973  
 Gordon Conference on Skeletal Muscle, 1980  
 Gordon Conference on Skeletal Muscle, 1983  
 Gordon Conference on Skeletal Muscle, 1985  
 Gordon Conference on Solid State Ionics, 1990

Gordon Conference on Ion Channels, 1998  
Gordon Conference on Ion Channels, 2000  
Harvard University (Neurobiology)  
Hebrew University, Jerusalem: Fritz Haber Lecturer in Physical Chemistry  
Hebrew University, Jerusalem: Bat Sheva (de Rothschild) Seminar  
Hebrew University, Jerusalem: Protein Dynamics and thermodynamics, participant and chair of a session.  
Henderson Symposium (Basic and Applied Statistical Mechanics of Condensed Matter, Brigham Young University, 2004)  
HRL (formerly Hughes Research Lab) Malibu: Physics Colloquium, 1999.  
HRL (formerly Hughes Research Lab) Malibu: Colloquium, 2005.  
IEEE International Conference on Pattern Recognition (1994), presented by Amir Averbuch and Moshe Israeli  
Intel Workshop on Early Disease Detection (Sept 2002)  
Institute for Pure and Applied Mathematics, IPAM, UCLA, Ion Channels (2002)  
Institute for Pure and Applied Mathematics, IPAM, UCLA, Inverse Problems, Lecture and ½ day Workshop (2003)  
Institute for Pure and Applied Mathematics, IPAM, Lake Arrowhead UCLA Conference: Inverse Problems Reunion (2005)  
Institute for Theoretical Physics, University of California, Santa Barbara, Conference on Electrostatic Effects in Complex Fluids and Biophysics, 1998  
International Conference on Circuit/System Theory, Sydney, Australia (1970)  
International Conference on Computational Nanoscience  
International Conference on Unsolved Problems of Noise and fluctuations in physics, biology, and high technology, Bethesda, 2002  
International Filter Symposium, Santa Monica, CA, 1972  
International Workshop on Computational Electronics: IWCE-5, 1997, Notre Dame.  
International Workshop on Computational Electronics, IWCE-6, 1998, Osaka  
International Workshop on Computational Electronics, IWCE-8, 2001, UIUC  
International Workshop on Computational Electronics, IWCE-9, 2003, Roma, Italia  
Johns Hopkins (Department of Biology)  
Johns Hopkins (Department of Biomedical Engineering)  
Laboratory of Molecular Biology, MRC, Cambridge England  
Lancaster University (Dept of Physics)  
Liblice Conference (5<sup>th</sup>) on Statistical Mechanics of Liquids  
Los Alamos National Laboratory (Center for Nonlinear Studies)  
Loyola University, Dept of Physiology, Maywood, Illinois  
Marquette University: Department of Biology  
Marquette University: Department of Mathematics  
Marine Biological Laboratory, Woods Hole  
Max Planck Institute (Heidelberg)  
Mayo Clinic  
McMaster University: Dept. of Physics (Hamilton, Ontario)  
Medical College of Virginia  
Medical College of Wisconsin  
Medical Research Council, Mill Hill, England

Merck, Sharpe, and Dhome  
 Mesilla Conference on Physical Chemistry (2001)  
 MIT Bio-Informatics Seminar (with the Whitehead Institute)  
 Monash University, Australia: Electrical Engineering  
 Monash University, Australia: Department of Physiology  
 NASA Ames: Biomolecular Systems  
 National Science Foundation (first MOBS Seminar: Modeling of Biological Systems)  
 New York University Medical School (Physiology)  
 New York University (Biology: Tamar Schlick's Group)  
 NATO Advanced Research Workshop. Ionic Soft Matter Lviv Ukraine  
 NIH (NINCDS, Arthritis Institute, GMS)  
 NISTI-NIGMS Digital Biology Speaker (2003)  
 NIST Physical and Chemical Properties Division  
 Northwestern University: Evanston, Applied Mathematics  
 Northwestern University Evanston, Mathematics "Conversations in Mathematics & Biology"  
 Northwestern University: Evanston, Neurosciences  
 Northwestern University Evanston, Physics and Engineering Sciences  
 Northwestern University: Chicago, Physiology  
 Notre Dame, Dept. of Electrical Engineering  
 Notre Dame, Dept of Chemistry and Biochemistry  
 Novartis Foundation Symposium: Gramicidin and Related Peptides, 1998  
 Novartis Foundation Meeting: Physical Models of Ion Permeation, 2000  
 Oregon Health Sciences University (Vollum Institute)  
 Oxford University (England) Physiology  
 Oxford University Biochemical Society (England)  
 Oxford University Seminar in Physical and Theoretical Chemistry (England)  
 Oxford University Seminar in Chemistry (Hagan Bayley)  
 Oxford University Mathematics Institute  
 PacifiChem (meeting of American Chemical Society, 2000)  
 Polytechnic University (NY) Dept of Chemical Engineering  
 Purdue University: Dept. of Biology  
 Purdue University: Dept. of Electrical Engineering: Solid State Physics  
 Rensselaer Polytechnic Institute Dept. of Mathematics  
 Rowland Institute (Cambridge MA)  
 Satellite Meeting (Debrecen) of International Physiological Congress, 1980  
 Schlumberger Cambridge Research  
 Society of General Physiologists Meeting, Woods Hole  
 Society of Industrial and Applied Mathematics:  
     Invited lecture, Conference on Applied Probability in Science & Engineering Society of Industrial and Applied Mathematics  
     Invited lecture, symposium on "Ionic Channels in Biological Membranes". Annual meeting, 1993  
     Invited lecture, symposium on Ionic Channels, 2001  
     Invited lecture, symposium Electrodiffusion: Modeling, Analysis, Simulation, and Applications, 2005

SPIE Annual Meeting (1994) *in* Symposium “Mathematical Imaging: Wavelet Applications” (presented by Amir Averbuch and Moshe Israeli)  
Stanford University (Department of Electrical Engineering)  
State University of New York (Albany)  
State University of New York (Stony Brook)  
Taft School Centennial Symposium  
Telluride Science Research Center Symposium on Biological Ion Channels (2003)  
Telluride Science Research Center Symposium on Biophysical and Biochemical Properties of Ion Channels in Epithelia (2004)  
Telluride Science Research Center Symposium Biological Ion channels: Structure and Function (2005)  
Texas Instrument Corporation  
Thomas Jefferson University: Daniel Baugh Institute  
TMR Meeting on Kinetics, Goteborg Sweden, 2000, Plenary Speaker  
Tulane University  
UCLA: Biology Department  
UCLA: Jerry Lewis Muscle Disease Center  
UCLA: Physiology Department  
UCLA: Molecular Biology Institute  
UCLA: Department of Anesthesiology  
UCLA School of Engineering  
UCLA Dept of Bioengineering  
University College (London): Biophysics  
University College (London): Physiology  
University of Buffalo (SUNY) Dept of Physiology and Biophysics  
University of Buffalo (SUNY) Dept of Electrical Engineering  
University of California (Berkeley) Chemical Engineering, Chakraborty Group  
University of California (Berkeley) Colloquium in Physics Dept (Marvin Cohen)  
University of California (Irvine) Miledi Group  
University of California (Irvine) Colloquium in Physics  
University of California (San Francisco)  
University of Chicago: Department of Biophysics  
University of Chicago: Department of Physiology  
University of Chicago: Department of Chemistry  
University of Chicago: Applied Mathematics  
University of Florida Dept. of Chemistry, Charles Martin’s Nanogroup  
University of Gröningen, Netherlands (Department of Chemistry)  
University of Hawaii (von Bekesy Laboratory)  
University of Illinois (Chicago): Department of Chemistry  
University of Illinois (Chicago): Department of Physics  
University of Illinois Medical School (Chicago): Department of Biochemistry  
University of Illinois Medical School (Chicago): Department of Ophthalmology  
University of Illinois Medical School (Chicago): Department of Physiology  
University of Illinois (Champaign-Urbana): Physiology  
University of Illinois (Champaign-Urbana): Biological Physics  
University of Illinois (Champaign-Urbana): Physics, Beckman Institute



University of Illinois (Champaign-Urbana): Computational Electronics  
 University of Linz, Oesterreich (Austria). Johan Radon Institute of Applied Mathematics.  
 University of Maryland (Baltimore): Physiology  
 University of Maryland (Baltimore): Biochemistry  
 University of Maryland (College Park): Electrical Engineering, Electrophysics Series  
 University of Maryland (College Park): Institute for Physical Science and Technology  
 University of Maryland (College Park): CSCAMM  
 University of Massachusetts (Amherst) Department of Chemistry  
 University of Miami: Biophysics and Physiology  
 University of Michigan: Michigan Interdisciplinary Mathematics Meeting.  
 University of Michigan: Seminar in Applied and Interdisciplinary Mathematics  
 University of New South Wales, Australia  
 University of Notre Dame (Dept. of Electrical Engineering)  
 University of Oklahoma  
 University of Pennsylvania  
 University of Rochester (Physiology)  
 University of Rochester (Neurology)  
 University of Rochester (Neuromuscular Center)  
 University of Sydney, Australia  
 University of Texas (Austin), Texas Inst. for Comp. and Appl. Math.  
 University of Texas (Austin), Physics and Mathematics Seminar  
 University of Texas (Galveston)  
 University of Texas (Galveston)  
 University of Texas (Southwestern: Dallas)  
 University of Tokyo (Neuroscience)  
 University of Utah  
 University of Vermont  
 University of Washington  
 European Mathematics Society: Plenary Lecture at AMAM 2003 (Applied Math ...)  
 Henderson Symposium (Basic and Applied Statistical Mechanics of Condensed Matter,  
 Brigham Young University, 2004)  
 NATO Advanced Research Workshop. Ionic Soft Matter Lviv Ukraine  
 Telluride Science Research Center Symposium on Biophysical and Biochemical Properties  
 of Ion Channels in Epithelia (2004) Texas Instrument Corporation  
 University of Florida (Dept. of Chemistry, Charles Martin's Nanogroup)  
 USA-Japan Seminar Excitation-Contraction Coupling, Tokyo 1971  
 Washington University, St. Louis, Physiology  
 Washington University, St. Louis, Center for Computational Chemistry  
 Weizmann Institute, Rehovot: Bat Sheva (de Rothschild) Seminar.  
 Weizmann Institute, Rehovot: Chemistry Dept  
 Western Nerve Net (San Diego)  
 Workshop on Wavelets: 16<sup>th</sup> International Conference of the IEEE Engineering in Biology  
 and Medicine Society.  
 World Congress on Medical Physics and Biomedical Engineering, 1994.  
 Yale University (Department of Physiology)  
 Yale University (Section of Neuroscience)

Yale University (Dept of Mathematics and Computational Science)  
Yangtze Conference on Fluids and Interfaces

### ***Symposia Organized***

- Chairman, Mini-symposium on **The Lens as a Syncytium**, Biophysical Society Meeting, 1980.
- Co-Chairman, with Brian Salzberg, **Symposium on Fine Processing in the Fine Processes of the Nervous System**, Biophysical Society Meeting, 1984.
- Chairman of Symposium and Luncheon **Calcium Signals in Muscle**, Biophysical Society Meeting, 1985
- Chairman of Symposium. **Nerve Impulse: From Conduction to Channels by way of Conductance** at the 100<sup>th</sup> Anniversary Meeting of the American Physiological Society, 1987.
- Chairman of Symposium. **Skeletal Muscle Physiology: an Update** at the 100<sup>th</sup> Anniversary Meeting of the American Physiological Society, 1987.
- Chairman of Minisymposium. **Moving through (Biological) Channels**, Society of Industrial and Applied Mathematics Conference on Applied Probability in Science and Engineering, New Orleans, 1990.
- Chairman of Minisymposium. **Ionic Movement through Biological Channels**. Society of Industrial and Applied Mathematics, Annual Meeting. Chicago, 1990.
- Organizer of Workshop: **From Structure to Permeation in Open Ionic Channels**. Biophysical Society Annual Meeting, Washington D.C., 1993
- Chairman of Symposium: **Ionic Channels: Natural Nanotubes**. American Physical Society Annual Meeting, 2000.
- Chairman and Organizer of **Novartis Foundation Meeting: Physical Models of Ion Permeation**, 2000
- Chairman and Organizer of Symposium at International Conference on Computational Nanoscience, 2001: Nanostructure Simulation from thin oxides to biological ion channels.
- Co-organizer of Yangtze Conference on Fluids and Interfaces (Chief Organizers Kwong-Yu Chan and D Henderson). Chairman, Ion Channels Session
- Organizer and Chairman of Nanostructures: biological ion channels to thin oxides. Nanotech 2003, San Francisco.
- Co-organizer and Chairman (with Dirk Gillespie) of Physical Models of Ion/Protein Interactions, American Physical Society (Div of Biological Physics) March, 2003. Austin, TX
- Chairman (Organizer Maria Kurnikova) Physics of Ion Interactions with Proteins, March, 2004, American Physical Society, Montreal Quebec Canada.
- Member, Organizing Committee, NATO Advanced Research Workshop. Ionic Soft Matter

Lviv Ukraine, 2004.

Helper to Andrij Trokhymchuk and David Busath, Festschrift for Doug Henderson, Brigham Young University, 2004.

Co-organizer, with Heinz Engl, RICAM Seminar on Ion Channels, Johan Radon Institute of Applied Mathematics, University of Linz, Oesterreich (Austria), 2004.

Organizer and Chair, Multiscale Analysis in Biology: Computation, American Physical Society, March, 2005, Los Angeles.

Organizer and Chair: MultiScale Analysis of Ions in Solutions, Proteins, and Channels: Analysis, American Physical Society, March, 2005, Los Angeles.

Problem Presenter: Mathematics in Medicine Study Group, Mathematics Institute, Oxford University, Sept. 2005

### ***Equipment and Software Designed***

Wide band amplifiers for microelectrode recording (with several collaborators, see publications 3, 9, 11, 16, 22, and 24).

Software for computing and analyzing impedance measurements with wide band amplifiers (*ibid.*)

**Axopatch Amplifier** for patch clamp recording, with R. Levis, J. Rae, and A. Finkel, sold by Axon Instruments, Burlingame CA, now part of Molecular Devices Sunnyvale CA.

**Perfusing Pipettes**, a hardware kit available from Adams-List Associates, for perfusing patch pipettes.

**PNP Online** <http://www.pnponline.org/> Interactive software for running Poisson Nernst Planck theory, with Duan Chen, Wolfgang Nonner, Uwe Hollerbach, Brice Burgess, SeeWing Chiu

**Patent Application**, PCT/NL2003/000013 Liquid Based Electronic Device

### ***Professional Societies***

American Association for Advancement of Science

American Mathematical Society

American Physiological Society

American Physical Society

American Society of Cell Biologists

Biophysical Society

Institute of Electrical and Electronic Engineering

Mathematical Association of America

New York Academy of Sciences

Physiological Society, England (Associate Member)

Royal Society of Chemistry (UK)

Society of General Physiologists  
 Society for Industrial and Applied Mathematics  
 Society of Neuroscience  
 Institute for Strategic Studies (London: 1963-1992)

### ***Research Interests***

**1960's-1980's:** Electrical properties of cells and tissues. The relationship between the structure of biological tissues and the pathways for current flow: measurements of linear electrical properties to determine equivalent circuits of skeletal and cardiac muscle, nerve, the lens of the eye, and epithelia.

The modeling of tissues of complex geometry and the solution—in physically meaningful form—of the differential (or difference) equations which describe such tissues. Thus, models of the three dimensional spread of current in spherical and cylindrical cells; models of the spread of current in the random network of transverse tubules in skeletal muscle; models of current flow in the clefts of cardiac muscle; models of current flow in epithelia; models of current flow in dendritic trees.

The use of advanced mathematical techniques (ranging from singular perturbation theory to—when all else fails—brute force numerical simulation) to provide insight into the physical meaning of complex theory.

**1960's-1990's:** Excitation-contraction coupling in skeletal and cardiac muscle; particularly, the junction between the tubular system and the sarcoplasmic reticulum and the mechanism of calcium release from the sarcoplasmic reticulum.

The electrical properties of the sarcoplasmic reticulum and its ionic channels as seen in patch clamp measurements from skinned muscle fibers.

**1980's – 2000's -... :** Analysis of ionic channels, experimental and theoretical: properties of single channels in epithelia, particularly “pressure activated” channels. Single channels in sarcoplasmic reticulum of skinned muscle fibers.

Design of patch clamp amplifiers, headstage, holders with “zero excess” noise.

Optimal detection of single channel events using signal detection theory.

Measurement of open channel noise.

Theoretical analysis of ion movement through channels using an hierarchy of models from molecular dynamics to continuum electrostatics.

Simulations of the molecular dynamics of channel proteins.

Stochastic analysis of flux over barriers: first passage times, concentration boundary conditions and ionic fluxes.

PNP model of the open channel. the Poisson-Nernst-Planck model of open channels, in which the potential distribution through the channel is calculated not assumed. PH model of the open channel, the Poisson Hydrodynamic model in which temperature changes are computed.

Coupling of fluxes, active transport, gating, and gating currents in a permanently open channel of one conformation as predicted by the PNP model in complex geometries and the PH model.

The stochastic generalization of the PNP model.

Simulations of the molecular dynamics of the entry process models of gramicidin.

## **2000's -... :**

Design and construction of ion channels as useful devices.

Thus, building design tools for understanding current flow in bulk solution, ion channels, and proteins in general.

Computation of macroscopic properties of ionic solutions and channels from higher resolution models, using Langevin-Poisson, Monte Carlo Poisson, or Molecular Dynamics Poisson methods.

Mathematical analysis of macroscopic properties of ionic solutions and channels starting from higher resolution models, using Langevin-Poisson, Monte Carlo Poisson, or Molecular Dynamics Poisson methods.

Simulations and theories of gating and conformational change.

Construction of nonequilibrium statistical mechanics starting from the properties of chaotic trajectories computed with Poisson and molecular dynamics. Statistical mechanics as stochastic processes.

Crowded Charge model of protein function, specifically, ion selectivity and permeation in ion channels.

## ***Administrative Work***

### **UCLA**

Member of Committee for Graduate Students.

First Year Advisor for Graduate Students.

Member of numerous review committees for promotions: received commendation from Vice Chancellor Saxon for work on review committees.

Member of Advisory Committee for the Jerry Lewis Muscular Dystrophy Center.

### **Rush University**

**Chairman**, Department of Physiology, then Department of Molecular Biophysics and Physiology. Recipient and first holder of "The Francis and Catherine Bard Chair of Physiology"

Department has approximately 10 tenure track faculty since 1976 and approximately 7,000 sq ft of usable research space. All faculty with research space (i.e., 4 laboratories) have had NIH or equivalent funding without interruption, thanks to their significant personal productivity. Key members (alphabetical order) in research: Fred Cohen (viral fusion), Tom DeCoursey ( $H^+$  ion channels), Eduardo Rios ( $Ca^{++}$  movement); in Medical School

Teaching, Rick Levis, Tom Shannon and Joel Michael; in Nursing Teaching Joe Zbilut.

**Academic Administration.**

Member of College Councils.

Chairman of Promotions and Appointments Committee.

Member, Vice Chair, then Chair of Search Committee for Microbiology Chair.

Vice Chairman of Search Committee for Dean of the Medical College.

Member, Search Committee for Dean of the Graduate College.

Member, Search Committee for Pediatrics Chair.

Member, Search Committee for Microbiology Chair

**Teaching**

General responsibility for all teaching activities of the Department at Rush, including course and curriculum reorganization. Physiology Lectures for medical and nursing students.

**Graduate students:**

J. Leung, R. Mathias, E. Engel, R. Levis, R. Milton (with R. Mathias), J. Tang, P. Gates, J. Wang, A. Hainsworth (with R. Levis), P. Dull (summer student), Dirk Gillespie, Amy Del Medico (summer student), Boaz Nadler (in significant part: Zeev Schuss, supervisor); Amit Singer (in significant part: Zeev Schuss, supervisor).

**Post-doctoral fellows:**

J. Howell, P. Vaughan, B. Mobley, A. Peskoff, R. Mathias, E. Engel, R. Levis, J. Bell, R. Milton (with Rick Mathias), K. Cooper, D.P. Chen, J. Tang, D.Rojewska; D.Gillespie; Z. Kuang, T. van der Straaten (with Umberto Ravaioli), S. Wigger-Aboud (with Marco Saraniti).

**Community Activity**

AVENUE BANK OF OAK PARK: Director, Member, then Chairman of Audit Committee, Executive Committee, and Marketing Committee (1987-1992).

AMERICAN HEART ASSOCIATION OF METROPOLITAN CHICAGO: Member, Board of Governors, Executive Committee, and President's Cabinet (1984-1986). Member Research Council (1989-1990) and Chairman, Committee on Human Experimentation.

TAFT SCHOOL (Connecticut): Speaker at Centennial Symposium, and Seminar/Discussion Group.

PRESIDENT 7320 Condo Association. (1997– 2003)

TOWN TALK Telluride Science Research Center (part of Pinhead Lecture Series) 2003.

ARMY RESEARCH OFFICE talk to North Carolina Ventures Program for High Schools 2005

## ROBERT S. EISENBERG

### PUBLICATIONS

[\[Laboratory of Robert S. Eisenberg\]](#)

#### *Electrical properties of tissues, mostly experimental:*

1. Eisenberg, R.S. and Hamilton, D. Action of  $\gamma$ -aminobutyric acid on *Cancer borealis* muscle. Nature 198: 1002-1003 (1963). [\[PDF\]](#)
2. Eisenberg, R.S. Impedance of single crab muscle fibers. Ph.D. Thesis, University of London (1965).
3. Eisenberg, R.S. Equivalent circuit of single crab muscle fibers as determined by impedance measurement with intracellular electrodes. J. Gen. Physiol. 50: 1785-1806 (1967). [\[PDF\]](#)
4. Eisenberg, R.S. and Gage, P.W. Frog skeletal muscle fibers: change in the electrical properties of frog skeletal muscle fibers after disruption of the transverse tubular system. Science 158: 1700-1701 (1967). [\[PDF\]](#)
5. Gage, P.W. and Eisenberg, R.S. Action potentials without contraction in frog skeletal muscle fibers with disrupted transverse tubules. Science 158: 1702-1703 (1967). [\[PDF\]](#)
6. Horowicz, P., Gage, P.W. and Eisenberg, R.S. The role of the electrochemical gradient in determining potassium fluxes in frog striated muscle. J. Gen. Physiol. 51: 193s-203s (1968). [\[PDF\]](#)
7. Eisenberg, B. and Eisenberg, R.S. The transverse tubular system in glycerol treated muscle. Science 160: 1243-1244 (1968). [\[PDF\]](#)
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