

ROBERT S. EISENBERG

Curriculum Vitae

November 18, 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

Main Position

Rush Medical College, Chicago IL

1995- Chairman of Molecular Biophysics and Physiology

1976 -.... Endowed Chair "The Francis and Catherine Bard Professor"

1976-1995 Chairman of Physiology

University of California at Los Angeles

1975-1976 Professor of Biomathematics and Physiology,

1970-1975 Associate Professor,. Department of Physiology

1968-1970 Assistant Professor,. Dept of Physiology, Chairman: W. Mommaerts

Duke University, Durham NC

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

Secondary Positions

Senior Scientist, Argonne National Laboratory (Mathematics and Computer Science
Division, Dec, 2005 - ...

Schlumberger Visiting Professor, University of Cambridge (UK) 2002

Visiting Fellow, Corpus Christi College, University of Cambridge (UK) 2002

Visiting Professor, 2000-2003 Computational Electronics, Beckman Institute, University
of Illinois, Urbana Champaign

Visiting Scientist, 1991-1995. Department of Physics, Brookhaven National Laboratory,
Upton, Long Island, NY.

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
 session chair.
 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)

Kansas University (Mathematics)
Laboratory of Molecular Biology, MRC, Cambridge England
Lancaster University (Dept of Physics)
Liblice Conference (5th) 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 Electrodifussion: 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
University of Wisconsin Madison (Electrical Engineering)
University of Wisconsin Madison (Contemporary Biochemistry)
University of Wisconsin Milwaukee

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
 Vanderbilt University Colloquium on Physics
 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: 16th 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 100th Anniversary Meeting of the American Physiological
 Society, 1987.
 Chairman of Symposium. **Skeletal Muscle Physiology: an Update** at the 100th
 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 γ -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). [\[PDF\]](#)
8. Eisenberg, B. and Eisenberg, R.S. Selective disruption of the sarcotubular muscle: A quantitative study with exogenous peroxidase as a marker. J. Cell Biol. 39: 451-467 (1968). [\[PDF\]](#)
9. Gage, P.W. and Eisenberg, R.S. Capacitance of the surface and transverse tubular membrane of frog sartorius muscle fibers. J. Gen. Physiol. 53: 265-278 (1969). [\[PDF\]](#)
10. Eisenberg, R.S. and Gage, P.W. Ionic conductance of the surface and transverse tubular membrane of frog sartorius fibers. J. Gen. Physiol. 53: 279-297 (1969). [\[PDF\]](#)
11. Gage, P.W. and Eisenberg, R.S. Action potentials, after potentials, and excitation-contraction coupling in frog sartorius fibers without transverse tubules. J. Gen. Physiol. 53: 298-310 (1969). [\[PDF\]](#)
12. Eisenberg, R.S., Howell, J. and Vaughan, P. The maintenance of resting potentials in glycerol treated muscle fibers. J. Physiol. 215: 95-102 (1971). [\[PDF\]](#)
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