

**ROBERT S. EISENBERG****PUBLICATIONS**

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

*Publication List maintained for all these years with loving care by John Tang, with thanks from Bob!*

**Papers: 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). PMID not available [\[PDF\]](#)
2. Eisenberg, R.S. Impedance of single crab muscle fibers. Ph.D. Thesis, University of London (1965). PMID not available [\[PDF\]](#)
3. Eisenberg, R.S. The equivalent circuit of single crab muscle fibers as determined by impedance measurement with intracellular electrodes. J. Gen. Physiol. 50: 1785-1806 (1967). [PMCID: PMC2225735](#) [\[PDF\]](#)
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). [PMID: 6070028](#) [\[PDF\]](#)
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). [PMID: 6059652](#) [\[PDF\]](#)
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). [PMCID: PMC2201208](#) [\[PDF\]](#)
7. Eisenberg, B. and Eisenberg, R.S. The transverse tubular system in glycerol treated muscle. Science 160: 1243-1244 (1968). [PMID: 5648264](#) [\[PDF\]](#)
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). [PMCID: PMC2107525](#) [\[PDF\]](#)
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). [PMCID: PMC2202908](#) [\[PDF\]](#)

10. Eisenberg, R.S. and Gage, P.W. Ionic conductances of the surface and transverse tubular membrane of frog sartorius fibers. *J. Gen. Physiol.* 53: 279-297 (1969). [PMCID: PMC2202906](#) [\[PDF\]](#)
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). [PMCID: PMC2202907](#) [\[PDF\]](#)
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). [PMCID: PMC1331868](#) [\[PDF\]](#)
13. Vaughan, P., Howell, J. and Eisenberg, R.S. The capacitance of skeletal muscle fibers in solutions of low ionic strength. *J. Gen. Physiol.* 59: 347-359 (1972). [PMCID: PMC2203175](#) [\[PDF\]](#)
14. Eisenberg, R.S., Vaughan, P. and Howell, J. A theoretical analysis of the capacitance of muscle fibers using a distributed model of the tubular system. *J. Gen. Physiol.* 59: 360-373 (1972). [PMCID: PMC2203177](#) [\[PDF\]](#)
15. Leung, J. and Eisenberg, R.S. The effects of the antibiotics gramicidin-A, amphotericin-B, and nystatin on the electrical properties of frog skeletal muscle. *Biochem. Biophys. Acta.* Amsterdam 298: 718-723 (1973). [PMID: 4541500](#) [\[PDF\]](#)
16. Valdiosera, R., Clausen, C. and Eisenberg, R.S. Measurement of the impedance of frog skeletal muscle fibers. *Biophys. J.* 14: 295-315 (1974). [PMCID: PMC1334509](#) [\[PDF\]](#)
17. Valdiosera, R., Clausen, C. and Eisenberg, R.S. Circuit models of the passive electrical properties of frog skeletal muscle fibers. *J. Gen. Physiol.* 63: 432-459 (1974). [PMCID: PMC2203561](#) [\[PDF\]](#)
18. Valdiosera, R., Clausen, C. and Eisenberg, R.S. Impedance of frog skeletal muscle fibers in various solutions. *J. Gen. Physiol.* 63: 460-491 (1974). [PMCID: PMC2203562](#) [\[PDF\]](#)
19. Mobley, B.A., Leung, J. and Eisenberg, R.S. Longitudinal impedance of skinned frog muscle fibers. *J. Gen. Physiol.* 63: 625-637 (1974). [PMCID: PMC2203567](#) [\[PDF\]](#)
20. Mobley, B.A., Leung, J. and Eisenberg, R.S. Longitudinal impedance of single frog muscle fibers. *J. Gen. Physiol.* 65: 97-113 (1975). [PMCID: PMC2214864](#) [\[PDF\]](#)
21. Eisenberg, R.S. and Rae, J.L. Current-voltage relationships in the crystalline lens. *J. Physiol.* 262: 285-300 (1976). [PMCID: PMC1307644](#) [\[PDF\]](#)
22. Mathias, R.T., Eisenberg, R.S. and Valdiosera, R. Electrical properties of frog skeletal muscle fibers interpreted with a mesh model of the tubular system. *Biophys. J.* 17: 57-93 (1977). [PMCID: PMC1473227](#) [\[PDF\]](#)
23. Eisenberg, R.S., Mathias, R.T. and Rae, J.L. Measurement, modeling, and analysis of the linear electrical properties of cells. *Ann. N.Y. Acad. Sci.* 303: 343-354 (1977). [PMID: 290301](#) [\[PDF\]](#)
24. Mathias, R.T., Rae, J.L. and Eisenberg, R.S. Electrical properties of structural components of the crystalline lens. *Biophys. J.* 25: 181-201 (1979). [PMCID: PMC1328454](#) [\[PDF\]](#)

25. Rae, J.L., Eisenberg, R.S. and Mathias, R.T. The lens as a spherical syncytium. Ed. Satish K. Srivastava. Elsevier North Holland Inc. **Red Blood Cell and Lens Metabolism**. pp. 277-292 (1980). PMID not available [[PDF](#)]
26. Mathias, R.T., Rae, J.L. and Eisenberg, R.S. The lens as a nonuniform spherical syncytium. *Biophys. J.* 34: 61-85 (1981). [PMCID: PMC1327454](#) [[PDF](#)]
27. Eisenberg, B. and Eisenberg, R.S. The *T-SR* junction in contracting single skeletal muscle fibers. *J. Gen. Physiol.* 79: 1-20 (1982). [PMCID: PMC2215487](#) [[PDF](#)]
28. Rae, J.L., Thomson, R.D. and Eisenberg, R.S. The effect of 2-4 dinitrophenol on cell to cell communication in the frog lens. *Exp. Eye Res.* 35: 597-610 (1982). [PMID: 6983973](#) [[PDF](#)]
29. Rae, J.L., Mathias, R.T. and Eisenberg, R.S. Physiological role of the membranes and extracellular space within the ocular lens. *Exp. Eye Res.* 35: 471-490 (1982). [PMID: 6983449](#) [[PDF](#)]
30. Eisenberg, R.S., McCarthy, R.T., and Milton, R.L. Paralysis of frog skeletal muscle fibres by the calcium antagonist D-600. *J. Physiol.* 341: 495-505 (1983). [PMCID: PMC1195346](#) [[PDF](#)]
31. Levis, R.A., Mathias, R.T., and Eisenberg, R.S. Electrical properties of sheep Purkinje strands. Electrical and chemical potentials in the clefts. *Biophys. J.* 44: 225-248 (1983). [PMCID: PMC1434818](#) [[PDF](#)]
32. Hui, C.S., Milton, R.L. and Eisenberg, R.S. Charge movement in skeletal muscle fibers paralyzed by the calcium entry blocker D600. *Proc. Natl. Acad. Sci.* 81: 2582-2585 (1984). [PMCID: PMC345107](#) [[PDF](#)]
33. Curtis, B.A. and Eisenberg, R.S. Calcium influx in contracting and paralyzed frog twitch muscle fibers. *J. Gen. Physiol.* 85: 383-408 (1985). [PMCID: PMC2215793](#) [[PDF](#)]
34. Milton, R.L., Mathias, R.T., and Eisenberg, R.S. Electrical properties of the myotendon region of frog twitch muscle fibers measured in the frequency domain. *Biophys. J.* 48: 253-267 (1985). [PMCID: PMC1329317](#) [[PDF](#)]
35. Eisenberg, R.S. Membranes, calcium, and coupling. *Can. J. Physiol. and Pharmacol.* 65: 686-690 (1987). [PMID: 2440543](#) [[PDF](#)]

**Papers: Theoretical Analysis and Modeling of Spread of Current:**

36. Eisenberg, R.S. and Johnson, E.A. Three dimensional electrical field problems in physiology. *Prog. Biophys. Mol. Biol.* 20: 1-65 (1970). PMID not available. [[PDF](#)]
37. Eisenberg, R.S. and Engel, E. The spatial variation of membrane potential near a small source of current in a spherical cell. *J. Gen. Physiol.* 55: 736-757 (1970). [PMCID: PMC2203023](#) [[PDF](#)]
38. Barcilon, V., Cole, J. and Eisenberg, R.S. A singular perturbation analysis of induced electric fields in nerve cells. *SIAM J. Appl. Math.* 21: No. 2, 339-354 (1971). PMID not available [[PDF](#)]

39. Eisenberg, R.S. and Costantin, L.L. The radial variation of potential in the transverse tubular system of skeletal muscle. *J. Gen. Physiol.* 58:700-701 (1971). [PMCID: PMC2226046](#) [\[PDF\]](#)
40. Engel, E., Barcilon, V. and Eisenberg, R.S. The interpretation of current-voltage relationships from a spherical cell recorded with a single microelectrode. *Biophys. J.* 12: 384-403 (1972). [PMCID: PMC1484114](#) [\[PDF\]](#)
41. Peskoff, A., Eisenberg, R.S. and Cole, J.D. Potential induced by a point source of current in the interior of a spherical cell. UCLA Engineering Report #7259, 62pp. (1972). [PMCID not available](#) [\[PDF\]](#)
42. Peskoff, A., Eisenberg, R.S. and Cole, J.D. Potential induced by a point source of current inside an infinite cylindrical cell. UCLA Engineering Report #7303, 70pp. (1973). [PMCID not available](#) [\[PDF\]](#)
43. Peskoff, A. and Eisenberg, R.S. Interpretation of some microelectrode measurements of electrical properties of cells. *Ann. Rev. Biophysics. and Bioeng.* 2: 65-79 (1973). [PMID: 4583658](#) [\[PDF\]](#)
44. Peskoff, A. and Eisenberg, R.S. A point source in a cylindrical cell: potential for a step-function of current inside an infinite cylindrical cell in a medium of finite conductivity. UCLA Engineering Report #7421, 73pp. (1974). [PMCID not available](#) [\[PDF\]](#)
45. Peskoff, A. and Eisenberg, R.S. The time-dependent potential in a spherical cell using matched asymptotic expansions. *Journal of Math. Biol.* 2: 277-300 (1975). [PMCID not available](#) [\[PDF\]](#)
46. Peskoff, A., Eisenberg, R.S. and Cole, J.D. Matched asymptotic expansions of the Green's function for the electric potential in an infinite cylindrical cell. *SIAM J. Appl. Math.* 30: 222-239, No. 2 (1976). [PMCID not available](#) [\[PDF\]](#)
47. Eisenberg, R.S., Barcilon, V., and Mathias, R.T. Electrical properties of spherical syncytia. *Biophys. J.* 25: 151-180 (1979). [PMCID: PMC1328453](#) [\[PDF\]](#)
48. Mathias, R.T., Levis, R.A. and Eisenberg, R.S. Electrical models of excitation contraction coupling and charge movement in skeletal muscle. *J. Gen. Physiol.* 76: 1-31, (1980). [PMCID: PMC2228590](#) [\[PDF\]](#)

**Papers: Electrical Properties of Ionic Channels:**

49. K.E. Cooper, Tang, J.M., Rae, J.L., and Eisenberg, R.S. A Cation Channel in Frog Lens Epithelia Responsive to pressure and Calcium. *J. Membrane Biology.* 93: 259-269 (1986). [PMID: 2434653](#) [\[PDF\]](#)
50. K.E. Cooper, P.Y. Gates, and Eisenberg, R.S. Surmounting barriers in ionic channels. *Quart. Rev. Biophysics.* 21: 331-364 (1988). [PMID: 2464837](#) [\[PDF\]](#)
51. K.E. Cooper, P.Y. Gates, and Eisenberg, R.S. Diffusion theory and discrete rate constants in ion permeation. *J. Membrane Biol.* 106: 95-105 (1988). [PMID: 2465414](#) [\[PDF\]](#)

52. J.M. Tang, J. Wang, and Eisenberg, R.S.  $K^+$  selective channel from sarcoplasmic reticulum of split lobster muscle fibers. *J. Gen. Physiol.* 94:261-278 (1989). [PMCID: PMC2228942](#) [\[PDF\]](#)
53. P.Y. Gates, K.E. Cooper, J. Rae, and Eisenberg, R.S. Predictions of diffusion models for one ion membrane channels. in *Progress in Biophysics and Molecular Biology.* 53: 153-196 (1989). PMCID not available [\[PDF\]](#)
54. P.Y. Gates, K.E. Cooper, and Eisenberg, R.S. Analytical diffusion models for membrane channels. in 2:223-81 **Ion Channels, Volume 2** (editor. T. Narahashi), Plenum Press (1990). [PMID: 1715205](#) [\[PDF\]](#)
55. D. Junge and R.S. Eisenberg. Uniqueness and interconvertibility among membrane potassium channels. *Comments on Theoret. Biology.* 11: 45-55 (1990). PMCID not available [\[PDF\]](#)
56. Tang, J.M., Wang, J., F.N. Quandt, and R.S. Eisenberg. Perfusing pipettes. *Pflügers Arch.* 416:347-350 (1990). [PMID: 2381768](#) [\[PDF\]](#)
57. Chen, D.P., Barcilon, V., and R.S. Eisenberg. Constant fields and constant gradients in open ionic channels. *Biophysical J.* 61:1372-1393 (1992). [PMCID: PMC1260399](#) [\[PDF\]](#)
58. Barcilon, V., D.P. Chen, and R.S. Eisenberg. Ion flow through narrow membrane channels. Part II. *SIAM Journal of Applied Mathematics* 52:1405-1425 (1992). PMCID not available [\[PDF\]](#)
59. Wang, J., Tang, J.M., and R.S. Eisenberg. A calcium conducting channel akin to a calcium pump. *J. Membrane Biology* 130:163-181 (1992). [PMID: 1283985](#) [\[PDF\]](#)
60. Barcilon, V., D.P. Chen, R. Eisenberg, and M. Ratner. Barrier crossing with concentration boundary conditions in biological channels and chemical reactions. *J. Chem. Phys.* 98(2) 1193-1211 (1993). PMCID not available [\[PDF\]](#)
61. Chen, D.P. and R.S. Eisenberg. Charges, currents, and potentials in ionic channels of one conformation. *Biophysical Journal.* 64:1405-1421 (1993a). [PMCID: PMC1262466](#) [\[PDF\]](#)
62. Chen, D.P. and R.S. Eisenberg. Flux, coupling, and selectivity in ionic channels of one conformation. *Biophysical Journal* 65:727-746 (1993b). [PMCID: PMC1225775](#) [\[PDF\]](#)
63. Hainsworth, A.H., Levis, R.A., and R.S. Eisenberg. Origins of open-channel noise in the large potassium channel of sarcoplasmic reticulum. *J. Gen. Physiol.* 104:857-884 (1994). [PMCID: PMC2229236](#) [\[PDF\]](#)
64. Eisenberg, R.S., Kłosek, M.M., and Schuss, Z. Diffusion as a chemical reaction: stochastic trajectories between fixed concentrations. *J. Chem. Phys.*, 102(4): 1767-1780 (1995). PMCID not available [\[PDF\]](#) and Revised Version [\[PDF\]](#)
65. Elber, R., Chen, D., Rojewska, D., and Eisenberg, R.S. Sodium in gramicidin: an example of a permion. *Biophysical Journal*, 68: 906-924, (1995). [PMCID: PMC1281815](#) [\[PDF\]](#)

66. Chen, D., Eisenberg, R., Jerome, J., and Shu, Chi-Wang. Hydrodynamic model of temperature change in open ionic channels. (1995) *Biophysical J.* 69: 2304-2322. [PMCID: PMC1236469](#) [PDF]
67. Barkai, E., Eisenberg, R.S., and Schuss, Z. (1996). A bidirectional shot noise in a singly occupied channel. *Physical Review E*, 54 1161-1175. [PMID: 9965184](#) [PDF]
68. Chen, D., Lear, J., and Eisenberg, Bob. (1997) Permeation through an Open Channel: Poisson-Nernst-Planck Theory of a Synthetic Ionic Channel. *Biophysical Journal*, 72: 97-116. [PMCID: PMC1184300](#) [PDF]
69. Barcion, V., Chen, D.-P., Eisenberg, R.S., and J.W. Jerome. (1997) Qualitative properties of steady-state Poisson-Nernst-Planck systems: perturbation and simulation study. *SIAM J. Appl. Math.* 57(3): 631-648. PMCID not available [PDF]
70. Chen, D.; Xu, L.; Tripathy, A.; Meissner, G.; Eisenberg, B. (1997) Permeation through the Calcium Release Channel of Cardiac Muscle. *with an appendix Rate Constants in Channology.* *Biophys. J.* 73(3) 1337-1354. [PMCID: PMC1181034](#) [PDF]
71. Nonner, W.; Chen, D.; Eisenberg, B. (1998) Anomalous Mole Fraction Effect, Electrostatics, and Binding in Ionic Channels. *Biophys. J.* 74 2327-2334. [PMCID: PMC1299576](#) [PDF]
72. Nonner, W. and Eisenberg, B. (1998) Ion Permeation and Glutamate Residues Linked by Poisson-Nernst-Planck Theory in L-type Calcium Channels. *Biophys. J.* 75:1287-1305. [PMCID: PMC1299804](#) [PDF]
73. Chen, D.; Xu, L.; Tripathy, A.; Meissner, G.; and Eisenberg, B. (1999) Selectivity and Permeation in Calcium Release Channel of Cardiac Muscle: Alkali Metal Ions. *Biophysical Journal* 76:1346-1366. [PMCID: PMC1300114](#) [PDF]
74. Hollerbach, U., Chen, D.P., Busath, D. D., and Eisenberg, B. (2000) Predicting function from structure using the Poisson-Nernst-Planck equations: sodium current in the gramicidin A channel. *Langmuir* 16:5509-5514. PMCID not available [PDF]
75. Gardner, C., Jerome, J. and R.S. Eisenberg (2000) Electrodifussion Model of Rectangular Current Pulses in Ionic Channels of Cellular Membranes. *SIAM J Applied Math* 61 792-802. PMCID not available [PDF]
76. Nonner, W., L. Catacuzzeno, and Eisenberg, B. (2000). Binding and Selectivity in L-type Ca Channels: a Mean Spherical Approximation. *Biophysical Journal* 79: 1976-1992. [PMCID: PMC1301088](#) [PDF]
77. Hollerbach, U., Chen, D.P., and Eisenberg, B. (2001) Two and Three Dimensional Poisson-Nernst-Planck Simulations of Current Through Gramicidin-A. *J. Scientific Computing* 16 (4) 373-409. PMCID not available [PDF]
78. Gillespie, D. and Eisenberg, R.S. (2001) Modified Donnan potentials for ion transport through biological ion channels. *Phys Rev E*, 63 061902 1-8. [PMID: 11415140](#) [PDF]
79. Nonner, W., Gillespie, D., Henderson, D., and Eisenberg, Bob. (2001) Ion accumulation in a biological calcium channel: effects of solvent and confining pressure. *J Physical Chemistry B* 105: 6427-6436. PMCID not available [PDF]

80. Schuss, Zeev, Nadler, Boaz, and Eisenberg, R.S. (2001) Derivation of PNP Equations in Bath and Channel from a Molecular Model. *Phys Rev E* 64: 036116 1-14. [PMID: 11580403](#) [[PDF](#)]
81. Hess, K., Ravaioli, U., Gupta, M., Aluru, N., van der Straaten, T., and R.S. Eisenberg (2001) Simulation of Biological Ionic Channels by Technology Computer-Aided Design. *VLSI Design* 13: pp.179-187. PMID not available [[PDF](#)]
82. Gillespie, Dirk, Nonner, W., Henderson, Douglas and Eisenberg, Robert S. (2002) A physical mechanism for large-ion selectivity of ion channels. *Physical Chemistry Chemical Physics*. 4, 4763-4769. PMID not available [[PDF](#)]
83. Gillespie, Dirk, and Eisenberg, Robert S. (2002). Physical descriptions of experimental selectivity measurements in ion channels. *European Biophysics Journal* 31: 454-466). [PMID: 12355255](#) [[PDF](#)]
84. Gillespie, Dirk, Nonner, W., and Eisenberg, Robert S. (2002) Coupling Poisson-Nernst-Planck and Density Functional Theory to Calculate Ion Flux. *Journal of Physics (Condensed Matter)* 14: 12129–12145. PMID not available [[PDF](#)]
85. Gardner, Carl L., Jerome, Joseph W., and Eisenberg. R.S. (2002) Electrodifusion Model Simulation of Rectangular Current Pulses in a Voltage Biased Biological Channel. *Journal of Theoretical Biology* 219: 291-299. [PMID: 12419658](#) [[PDF](#)]
86. Gardner, Carl L., Jerome, Joseph W., and Eisenberg. R.S. (2002) Electrodifusion Model Simulation of Rectangular Current Pulses in a Biological Channel. *J Computational Electronics*, 1: 347-351. PMID not available [[PDF](#)]
87. van der Straaten, T.A., Tang, J., Eisenberg, R.S., Ravaioli, U., and Aluru, N.R. (2002) Three-dimensional continuum simulations of ion transport through biological ion channels: effects of charge distribution in the constriction region of porin. *J. Computational Electronics* 1: 335-340 PMID not available [[PDF](#)]
88. Boda, D., Busath, D., Eisenberg, B., Henderson, D., and Nonner, W. (2002) Monte Carlo Simulations of ion selectivity in a biological Na channel: charge-space competition. *Physical Chemistry Chemical Physics* 4: 5154-5160. PMID not available [[PDF](#)]
89. Hollerbach, Uwe and Robert Eisenberg. (2002) Concentration-Dependent Shielding of Electrostatic Potentials Inside the Gramicidin A Channel. *Langmuir* 18: 3262-3631. PMID not available [[PDF](#)]
90. Gillespie, D., Nonner, W. and RS Eisenberg. (2003) Crowded Charge in Biological Ion Channels *Nanotech* 3: 435-438. PMID not available [[PDF](#)]
91. Nadler, B., Schuss, Z., Singer, A., Eisenberg, B. (2003) Diffusion through protein channels: from molecular description to continuum equations. *Nanotech* 3: 439-442. PMID not available [[PDF](#)]
92. Wigger-Aboud, S., Saraniti, M. and R. Eisenberg. (2003) Self-consistent particle based simulations of three dimensional ionic solutions. *Nanotech* 3: 443-446. PMID not available [[PDF](#)]

93. Aboud, S., Saraniti, M. and R. Eisenberg. (2003) Computational issues in modeling ion transport in biological channels: Self-consistent particle-based simulations. *Journal of Computational Electronics* 2: 239-243. PMID not available [[PDF](#)]
94. van der Straaten, T., Kathawala, G., Kuang, Z., Boda, D., Chen, D.P., Ravaioli, U., Eisenberg, R.S., and Henderson, D. (2003) Equilibrium structure of electrolyte calculated using equilibrium Monte Carlo, Molecular Dynamics, and Transport Monte Carlo simulation. *Nanotech* 3: 447-451. PMID not available [[PDF](#)]
95. Chen, D.; Xu, L.; Eisenberg, B; and Meissner, G. (2003) Calcium Ion Permeation through the Calcium Release Channel (Ryanodine Receptor) of Cardiac Muscle. *J Phys Chem* 107 9139-9145. PMID not available [[PDF](#)]
96. Nadler, Boaz, Hollerbach, Uwe, Eisenberg, Bob. (2003) The Dielectric Boundary Force and its Crucial Role in Gramicidin. *Phys. Rev. E* 68 021905 p1-9. [PMID: 14525004](#) [[PDF](#)]
97. Gillespie, Dirk, Nonner, Wolfgang, and Eisenberg, Robert S. (2003) Density functional theory of charged, hard-sphere fluids. *Phys Rev E* 68 0313503 1-10. [PMID: 14524773](#) [[PDF](#)]
98. van der Straaten, T. A., Tang, J. M., Ravaioli, U., Eisenberg, R. S. and Aluru, N. (2003) Simulating Ion Permeation Through the OmpF Porin Ion channel Using Three-Dimensional Drift-Diffusion Theory. *Journal of Computational Electronics* 2: 29-47. PMID not available [[PDF](#)]
99. Boda, Dezso, Varga, Tibor, Henderson, Douglas, Busath, David, Nonner, Wolfgang, Gillespie, Dirk, and Bob Eisenberg. (2004) Monte Carlo simulation study of a system with a dielectric boundary: application to calcium channel selectivity. *Molecular Simulation* 30: 89-96. PMID not available [[PDF](#)]
100. Gardner, Carl, Nonner, Wolfgang, and Eisenberg, Robert S. (2004) Electrodiffusion Model Simulation of Ionic Channels: 1D Simulations. *Journal of Computational Electronics* 3: 25–31. PMID not available [[PDF](#)]
101. Boda, Dezso, Gillespie, Dirk, Nonner, Wolfgang, Henderson, Douglas and Bob Eisenberg. (2004) Computing induced charges in inhomogeneous dielectric media: application in a Monte Carlo simulation of complex ionic systems. *Phys Rev E* 69, 046702. [PMID: 15169126](#) [[PDF](#)]
102. Goryll, M., Wilk, S., Laws, G. M., Thornton, T. J., Goodnick, S. M., Saraniti, M., Tang, J. M. and R. S. Eisenberg (2003) Silicon-based ion channel sensor Superlattices & Microstructures 34(3-6), 451-457. PMID not available [[PDF](#)]
103. Goryll, M., Wilk, S., Laws, G.M., Thornton, T. J., Goodnick, S. M., Saraniti, M., Tang, J. M. and R. S. Eisenberg (2004) Ion Channel Sensor on a Silicon Support Mat. *Res. Soc. Symp. Proc.* Vol. 820, O7.2.1-5. Proceedings Title: Nanoengineered Assemblies and Advanced Micro/Nanosystems Editors (Symposium O): Jun Liu, Jeffrey T. Borenstein, Piotr Grodzinski, Luke P. Lee, Zhong Lin Wang. PMID not available [[PDF](#)]
104. Nadler, Boaz, Schuss, Zeev, Singer, Amit, and RS Eisenberg. (2004) Ionic diffusion through confined geometries: from Langevin equations to partial differential equations. *J. Physics: Condensed Matter* 16: S2153-S2165. PMID not available [[PDF](#)]



105. Schuss, Zeev, B. Nadler, A. Singer, and R.S. Eisenberg, Models of boundary behavior of particles diffusing between two concentrations in *Fluctuations and Noise in Biological, Biophysical, and Biomedical Systems II* editors: D. Abbot, S. M. Bezrukov, A. Der, A. Sanchez, 26-28 May 2004 Maspalomas, Gran Canaria, Spain, Spie proceedings series Volume 5467, pp. 345-358. PMID not available [\[PDF\]](#)
106. Miedema, Henk, Anita Meter-Arkema, Jenny Wierenga, John Tang, Bob Eisenberg, Wolfgang Nonner, Hans Hektor, Dirk Gillespie and Wim Meijberg (2004) Permeation properties of an engineered bacterial OmpF porin containing the EEEE-locus of Ca<sup>2+</sup> channels. *Biophysical Journal* Volume 87: 3137–3147. doi: 10.1529/biophysj.104.041384 [PMCID: PMC1304784](#) [\[PDF\]](#)
107. Aboud, S., Marreiro, D., Saraniti, M., and R. Eisenberg. (2004) A Poisson P3M Force Field Scheme for Particle-Based Simulations of Ionic Liquids. *J. Computational Electronics*, 3: 117–133. PMID not available [\[PDF\]](#)
108. Wilk, Seth, Goryll, Michael, Laws, Gerard M., Goodnick, Stephen M., Thornton, Trevor J., Saraniti, Marco, Tang, John M. and Eisenberg, Robert S. (2004) Teflon coated silicon aperture for lipid bilayer attachment. *Applied Physics Letters*, 85, 3307-3309 PMID not available [\[PDF\]](#)
109. Nadler, Boaz, Schuss, Zeev, Hollerbach, Uwe, R.S. Eisenberg. (2004) Saturation of conductance in single ion channels: the blocking effect of the near reaction field. *Phys Rev E* 70, 051912. [PMID: 15600661](#) [\[PDF\]](#)
110. Nonner, Wolfgang, Peyser, Alexander, Gillespie, Dirk, and Bob Eisenberg. (2004) Relating microscopic charge movement to macroscopic currents: the Ramo-Shockley theorem applied to ion channels. *Biophysical Journal*, 87: 3716-22. doi: 10.1529/biophysj.104.047548 [PMCID: PMC1304885](#) [\[PDF\]](#)
111. Singer, A., Schuss, Z., Nadler, B., and RS Eisenberg (2004) Memoryless control of boundary concentrations of diffusing particles. *Phys Rev E* 70, 061106. [PMID: 15697340](#) [\[PDF\]](#)
112. van der Straaten, Trudy A., Kathawala, G. Trelakis, A., Eisenberg, R.S., Ravaioli, U. (2005) BioMOCA — a Boltzmann transport Monte Carlo model for ion channel simulation. *Molecular Simulation*, 31: 151-171. PMID not available [\[PDF\]](#)
113. Aguilera-Arzo, Marcel, Aguilera, Vicente and R. S. Eisenberg (2005) Computing numerically the access resistance of a pore. *European Biophysics Journal*, 34: 314-322. [PMID: 15756588](#) [\[PDF\]](#)
114. Aboud, Shela, Marreiro, David, Saraniti, Marco, and Robert Eisenberg. (2005) The Role of Long-Range Forces in Porin Channel Conduction. *Journal of Computational Electronics* 4: 175–178. PMID not available [\[PDF\]](#)
115. Marreiro, David, Aboud, Shela, Saraniti, Marco, and Robert Eisenberg. (2005) Error Analysis of the Poisson P3M Force Field Scheme for Particle-Based Simulations of Biological Systems. *Journal of Computational Electronics* 4: 179–183. PMID not available [\[PDF\]](#)

116. Singer, Amit, Schuss, Zeev, and R. S. Eisenberg. (2005) Attenuation of the electric potential and field in disordered systems *J. Stat. Phys.* 119 (5/6) 1397-1418. PMID not available [[PDF](#)] Posted on <https://arxiv.org> with Paper ID [arXiv:0501048](#)
117. Boda, D., Gillespie, D., Eisenberg, B., Nonner, W., Henderson, D. (2005) Induced Charge Computation Method: Application in Monte Carlo simulations of inhomogeneous dielectric systems p. 19–43. *in* D. Henderson et al. (eds.), Ionic Soft Matter: Modern Trends in Theory and Applications, Springer NY. PMID not available [[PDF](#)]
118. Singer, Amit, Schuss, Zeev, Holcman, David and R. S. Eisenberg. (2006) Narrow Escape. Part I, *J. Stat. Phys.* 122, 437-463. PMID not available [[PDF](#)] Posted on <https://arxiv.org> with Paper ID [arXiv:0412048](#)
119. Siwy, Zuzanna, Powell, Matthew R., Kalman, Eric, Astumian, R. Dean, Eisenberg, Robert S. (2006) Negative Incremental Resistance Induced by Calcium in Asymmetric Nanopores. *Nano Letters* 6, 473-477. [PMID: 16522045](#) [[PDF](#)]
120. Miedema, Henk, Vrouwenraets, Maarten, Wierenga, Jenny, Eisenberg, Bob, Schirmer, Tilman, Baslé, Arnaud and Wim Meijberg. (2006) Conductance and selectivity fluctuations in D127 mutants of the bacterial porin OmpF. *European Journal of Biophysics*, 36 13-22. [PMID: 16858566](#) [[PDF](#)]
121. Siwy, Zuzanna, Powell, Matthew R., Petrov, Alexander, Kalman, Eric, Trautmann, Christina, and Eisenberg, Robert S. (2006) Calcium-Induced Voltage Gating in Single Conical Nanopores. *Nano Letters* 6, 1729 -1734. [PMID: 16895364](#) [[PDF](#)]
122. Boda, Dezsó, Valisko, Monika, Eisenberg, Bob, Nonner, Wolfgang, Henderson, Douglas, and Dirk Gillespie (2006) The Effect of Protein Dielectric Coefficient on the Ionic Selectivity of a Calcium Channel. *Journal of Chemical Physics* 125, 034901 1-11. [PMID: 16863379](#) [[PDF](#)]
123. Miedema, Henk, Vrouwenraets, Maarten, Wierenga, Jenny, Gillespie, Dirk, Eisenberg, Bob, Meijberg, Wim and Wolfgang Nonner. (2006) Ca<sup>2+</sup> selectivity of a chemically modified OmpF with reduced pore volume. *Biophysical J.* 91 4392-4400. doi: 10.1529/biophysj.106.087114 [PMCID: PMC1779923](#) [[PDF](#)]
124. Eisenberg, Bob, Nonner, Wolfgang (2007) Shockley-Ramo Theorem Measures Conformation Changes of Ion Channels and Proteins. *J Computational Electronics* 6:363-345. PMID not available [[PDF](#)]
125. Eisenberg, Bob, Liu, Weishi (2007) Poisson-Nernst-Planck systems for ion channels with permanent charges. *SIAM Journal on Mathematical Analysis* 38, No. 6, pp. 1932–1966. PMID not available [[PDF](#)]
126. Burger, Martin, Eisenberg, Robert S. and Heinz Engl (2007) Inverse Problems Related to Ion Channel Selectivity. *SIAM J Applied Math* Vol. 67, No. 4, pp. 960–989. PMID not available [[PDF](#)]
127. Boda, Dezsó, Valisko, Monika, Eisenberg, Bob, Nonner, Wolfgang, Henderson, Douglas, and Dirk Gillespie (2007). The combined effect of pore radius and protein dielectric coefficient on the selectivity of a calcium channel. *Phys Rev. Letters* 98 168102 p.1-4. [PMID: 17501467](#) [[PDF](#)]

128. Boda, Dezsó, Nonner, Wolfgang, Valisko, Mónica, Henderson, Douglas, Eisenberg, Bob, and Dirk Gillespie (2007) Steric Selectivity in Na Channels Arising from Protein Polarization and Mobile Side Chains. *Biophysical Journal* 93:1960-1980. doi: 10.1529/biophysj.107.105478 [PMCID: PMC1959557](#) [\[PDF\]](#)
129. Wilk, S.J., Petrossian, L., Goryll M., Thornton, T.J., Goodnick, S.M., Tang, J.M., Eisenberg R.S. (2007) Integrated Electrodes on a Silicon Based Ion Channel Measurement Platform. *Biosensors and Bioelectronics* [Volume 23, Issue 2](#), 30 September 2007, Pages 183-190. [doi:10.1016/j.bios.2007.03.030](#). [PMID: 17507211](#) [\[PDF\]](#)
130. Miedema, Henk Vrouwenraets, Maarten Wierenga, Jenny Meijberg, Wim, Robillard, George and Bob Eisenberg (2007) A biological porin engineered into a molecular, nanofluidic diode. *Nanoletters* 7: 2886-2891. [PMID: 17691852](#) [\[PDF\]](#)
131. D G Luchinsky, R Tindjong, P V E McClintock, I Kaufman and R S Eisenberg, “On selectivity and gating of ionic channels”, in S M Bezrukov ed. *Noise and Fluctuations in Biological, Biophysical and Biomedical Systems*, Proc. of conf. in Florence, 2007, SPIE Proc. **6602** (SPIE, Bellingham, WA, 2007), art. no. 66020D. [PMCID not available](#) [\[PDF\]](#)
132. R Tindjong, D G Luchinsky, P V E McClintock, I Kh Kaufman and R S Eisenberg, “Effect of charge fluctuations on the permeation of ions through biological ion channels”, in M.Tacano et al. ed. *Noise and Fluctuations, ICNF 2007*, AIP vol. 922, Melville, New York, 2007, pp 647–650. [PMCID not available](#) [\[PDF\]](#)
133. D G Luchinsky, R Tindjong, I Kaufman, PVE McClintock and RS Eisenberg, Ionic channels as electrostatic amplifiers of charge fluctuations *Electrostatics 2007*, Journal of Physics Conference Series **142** 2008 012049 [PMCID not available](#) [\[PDF\]](#)
134. Boda, Dezsó, Nonner, Wolfgang, Henderson, Douglas, Eisenberg, Bob, and Dirk Gillespie. (2008) Volume exclusion in calcium selective channels. *Biophys. J.*, 94: 3486–3496 *BioFAST*: January 16, 2008. doi: 10.1529/biophysj.107.122796 [PMCID: PMC2292364](#) [\[PDF\]](#)
135. Roth, Roland, Gillespie, Dirk, Nonner, Wolfgang, Eisenberg, Bob. (2008) Bubbles, gating and anesthetics in ion channels. *Biophysical Journal* Volume 94 4282–4298 published online as January 30, 2008 as *BioFAST*, doi:10.1529/biophysj.107.120493 [PMCID: PMC2480679](#) [\[PDF\]](#) *note misprint in middle initial of RSE in print edition.*
136. Powell, Matthew; Sullivan, Michael; Vlassioux, Ivan; Constantin, Dragos; Sudre, Olivier; Martens, Craig, Eisenberg, Robert; and Siwy, Zuzanna (2008) Nanoprecipitation Assisted Ion Current Oscillations. *Nature Nanotechnology* 3, 51 - 57 (01 Jan 2008). doi: 10.1038/nnano.2007.420 [PMID: 18654451](#) [\[PDF\]](#)
137. Eisenberg, Bob. (2008). Bubble Gating Currents in Ionic Channels. Posted on <https://arxiv.org> with Paper ID [arXiv:0802.0308v1](#). [PMCID not available](#) [\[PDF\]](#)
138. Singer, A. Gillespie, D., Norbury J., and Eisenberg, R.S. (2008) Singular perturbation analysis of the steady state Poisson-Nernst-Planck system: applications to ion channels. *European Journal of Applied Mathematics* vol. 19, pp. 541–560. doi: 10.1017/S0956792508007596 [PMCID: PMC2756831](#) [\[PDF\]](#)

139. Abaid, Nicole, Eisenberg, R.S., Liu, Weishi. (2008) Asymptotic expansions of I-V relations via a Poisson-Nernst-Planck system. *SIAM Journal of Applied Dynamical Systems*. 7 1507-1526. PMID not available [\[PDF\]](#)
140. Boda, Dezső, Valisko, Monika, Henderson, Douglas, Eisenberg, Robert, Gilson, Michael. (2009) Ions and Inhibitors in the Binding Site of HIV-Protease: Comparison of Monte Carlo Simulations and the Linearized Poisson-Boltzmann Theory. *Biophysical Journal* 96 1293–1306. doi: 10.1016/j.bpj.2008.10.059 [PMCID: PMC2717253](#) [\[PDF\]](#)
141. Boda, Dezső, Valisko, Monika, Henderson, Douglas, Eisenberg, Bob, Gillespie, Dirk, and Wolfgang Nonner. (2009) Ionic selectivity in L-type calcium channels by electrostatics and hard-core repulsion. Cover of *Journal of General Physiology* [\[COVER\]](#) and 133 p. 497-509. doi: 10.1085/jgp.200910211 [PMCID: PMC2712969](#) [\[PDF\]](#)
142. He, Yan, Gillespie, Dirk, Boda, Dezső, Vlasiouk Ivan, Eisenberg, Robert S., and Zuzanna S. Siwy. (2009) Tuning transport properties of nanofluidic devices with local charge inversion. *Journal of the American Chemical Society* 131 (14), pp 5194–5202. doi: 10.1021/ja808717u [PMCID: PMC2714767](#) [\[PDF\]](#)
143. Bardhan, Jaydeep P., Eisenberg, Robert S., and Dirk Gillespie. (2009) Discretization of the Induced-Charge Boundary Integral Equation. *Physical Review E*. 80, 011906. [PMCID: PMC3700357](#) [\[PDF\]](#)
144. Luchinsky, D. G., Tindjong, R., Kaufman, I., McClintock, P.V.E., and R.S. Eisenberg. (2009) Self-consistent analytic solution for the current and the access resistance in open ion channels. *Physical Review E* 80, 021925. [PMID: 19792169](#) [\[PDF\]](#)
145. Malasics, Attila, Gillespie, Dirk, Nonner, Wolfgang, Henderson, Douglas, Eisenberg, Bob, Boda, Dezső. (2009) Protein structure and ionic selectivity in calcium channels: Selectivity filter size, not shape, matters. *Biophysica and Biochimica Acta: Biomembranes Biochimica et Biophysica Acta* 1788, 2471–2480. doi: 10.1016/j.bbamem.2009.09.022 [PMCID: PMC2789594](#) [\[PDF\]](#)
146. Luchinsky, D. G., Tindjong, R., Kaufman, I., McClintock, P.V.E., and R.S. Eisenberg. (2009) Charge fluctuations and their effect on conduction in biological ion channels. *Journal of Statistical Mechanics: Theory and Experiment*. P01010. doi:10.1088/1742-5468/2009/01/P01010. PMID not available [\[PDF\]](#)
147. Knepley, Matthew G., Karpeev, Dmitry A., Davidovits, Seth, Eisenberg, Robert S., and Dirk Gillespie. (2010) An efficient algorithm for classical density functional theory in three dimensions. *Journal of Chemical Physics* 132, 124101-1 to 124101-11. doi: 10.1063/1.3357981 [PMCID: PMC2856503](#) [\[PDF\]](#) Posted on <https://arxiv.org> with Paper ID [arXiv:0910.1531](https://arxiv.org/abs/0910.1531).
148. Zhang, Chao; Raugei, Simone, Eisenberg, Robert, and Paolo Carloni. (2010) Molecular Dynamics in Physiological Solutions: Force-fields, Alkali Metal Ions, and Ionic Strength. *Journal of Chemical Theory and Computation*. 6:2167-2175. PMID not available [\[PDF\]](#)

149. Eisenberg, Bob, Hyon, YunKyong, and Chun Liu. (2010) Energy Variational Analysis EnVarA of Ions in Water and Channels: Field Theory for Primitive Models of Complex Ionic Fluids. *Journal of Chemical Physics*. 133, 104104 (23 pages). doi: 10.1063/1.3476262 [PMCID: PMC2949347](#) [\[PDF\]](#)
150. Hyon, YunKyong, Eisenberg, Bob and Chun Liu. (2010) A mathematical model of the hard sphere repulsion in ionic solutions. *Communications in Mathematical Sciences* **9**, pp. 459–475. PMCID not available [\[PDF\]](#)
151. Eisenberg, B., Multiple Scales in the Simulation of Ion Channels and Proteins. (2010) *The Journal of Physical Chemistry C*, 2010. **114** (48): p. 20719-20733. doi: 10.1021/jp106760t [PMCID: PMC2996618](#) [\[PDF\]](#) Preprint available on arXiv at <https://arxiv.org/abs/1902.09528> [\[PDF\]](#)
152. Giri, Janhavi, Fonseca, James. E., Boda, Dezső, Henderson, Douglas, and Eisenberg, Bob. (2011) Self-organized Models of Selectivity in Calcium Channels. *Physical Biology* **8** 026004. doi: 10.1088/1478-3975/8/2/026004 [PMID: 21263167](#) [\[PDF\]](#)
153. Boda, Dezső, Giri, Janhavi, Henderson, Douglas Eisenberg, Robert and Gillespie, Dirk. (2011) Analyzing the components of the free energy landscape in a calcium selective ion channel by Widom's particle insertion method. *Journal of Chemical Physics*. **134**, 055102. doi: 10.1063/1.3532937 [PMCID: PMC3045419](#) [\[PDF\]](#)
154. Krauss, Daniel, Eisenberg, Bob and Gillespie, Dirk. (2011) Selectivity sequences in a model calcium channel: Role of electrostatic field strength. *European Journal of Biophysics*, **40**(6): p. 775-782. doi: 10.1007/s00249-011-0691-6 [PMCID: PMC3124256](#) [\[PDF\]](#)
155. Boda, Dezső, Henderson, Douglas, Eisenberg, Bob and Dirk Gillespie. (2011) A method for treating the passage of a charged hard sphere ion as it passes through a sharp dielectric boundary. *Journal of Chemical Physics*, 135(6): 64105. doi: 10.1063/1.3622857 [PMCID: PMC3170393](#) [\[PDF\]](#)
156. Mori, Yoichiro, Liu, Chun, and RS Eisenberg. (2011) A model of electrodiffusion and osmotic water flow and its energetic structure. *Physica D: Nonlinear Phenomena* 240(22): 1835-1852. PMCID not available [\[PDF\]](#) See early version in the 'Everything Else' section of this Publication List, item 34. Mori, *et al.*
157. Hyon, YunKyong, Fonseca, James E., Eisenberg, Bob, and Chun Liu. (2012) Energy variational approach to study charge inversion (layering) near charged walls. *Discrete and Continuous Dynamical Systems - Series B (DCDS-B)* 17(8) 2725-2743. PMCID not available [\[PDF\]](#)
158. Berti, Claudio, Gillespie, Dirk, Eisenberg, Robert S. and Claudio Fiegna. (2011) Particle-based simulation of charge transport in discrete-charge nano-scale systems: the electrostatic problem. *Nanoscale Research Letters INEC 2011 Special Issue. Nanoscale Res Lett.* 2012; 7(1): 135. doi: 10.1186/1556-276X-7-135 [PMCID: PMC3395871](#) [\[PDF\]](#)
159. Ryham, Rolf, Cohen, Frederic S. and Robert Eisenberg. (2012). A Dynamic Model of Open Vesicles in Fluids. *Communications in Mathematical Sciences*. 10: No. 4, pp. 1273–1285. PMCID not available [\[PDF\]](#)

160. Giri, Janhavi, Tang, John M., Wirth, Christophe, Peneff, Caroline M. and Bob Eisenberg. (2012) Single Channel Measurements of N-Acetylneuraminic Acid-Inducible Outer Membrane Channel in *Escherichia coli*. European Biophysics Journal 41(3): 259-271. doi: 10.1007/s00249-011-0781-5 [PMCID: PMC3288477](#) [\[PDF\]](#)
161. Jimenez-Morales, David, Liang, Jie and Bob Eisenberg. (2012) Ionizable Side Chains at Catalytic Active Sites of Enzymes European Biophysics Journal 41 (5): 449-460. doi: 10.1007/s00249-012-0798-4 [PMCID: PMC3360948](#) [\[PDF\]](#)
162. Tindjong, R., Kaufman, I., McClintock, P.V.E., Luchinsky, D.G. and R.S. Eisenberg. (2012) Nonequilibrium rate theory for conduction in open ion channels. Fluctuation and Noise Letters. 11:1240016. PMCID not available [\[PDF\]](#)
163. Berti, Claudio, Gillespie, Dirk, Bardhan, Jaydeep, Eisenberg, Robert S., and Claudio Fiegna. (2012) Comparison of three-dimensional Poisson solution methods for particle-based simulation and inhomogeneous dielectrics Physical Review E 86(1): 011912. [PMID: 23005457](#) [\[PDF\]](#)
164. Horng, Tzyy-Leng, Lin, Tai-Chia, Liu, Chun and Bob Eisenberg. (2012) PNP Equations with Steric Effects: A Model of Ion Flow through Channels. Journal of Physical Chemistry B 116(37): 11422-11441 <http://dx.doi.org/10.1021/jp305273n>. [PMID: 22900604](#) [\[PDF\]](#)
165. Kaufman, I., Luchinsky, D.G., Tindjong, R., McClintock, P.V.E., and R.S. Eisenberg. (2013) Multi-ion conduction bands in a simple model of calcium channels. Physical Biology 10 026007 (8pp) Posted on <https://arxiv.org> with Paper ID [arXiv 1209.2381](#) doi: 10.1088/1478-3975/10/2/026007 [PMID: 23481350](#) [\[PDF\]](#)
166. Finnerty, Justin, Bob Eisenberg and Paolo Carloni. (2013) Localizing the charged side chains of ion channels within the crowded charge models. Journal of Chemical Theory and Computation J. Chem. Theory Comput. 9, 766-773 [10.1021/ct300768j](https://doi.org/10.1021/ct300768j). PMCID not available [\[PDF\]](#)
167. Tindjong, R., Kaufman, I., Luchinsky, D.G., McClintock, P.V.E., Khovanov, I., and R.S. Eisenberg. (2013) Non-equilibrium stochastic dynamics of open ion channels. Nonlinear Phenomena in Complex Systems 16(2) 146-161. PMCID not available [\[PDF\]](#)
168. Tu, Bin, Chen, Minxin, Xie, Yan, Zhang, Linbo, Eisenberg, Bob, and Benzhuo Lu. (2013) A Parallel Finite Element Simulator for Ion Transport through Three-dimensional Ion Channel Systems. Journal of Computational Chemistry 34:2065-2078. doi: 10.1002/jcc.23329 [PMID: 23740647](#) [\[PDF\]](#)
169. Hyon, YunKyong, Bob Eisenberg and Chun Liu. (2013) An energetic variational approach to ion channel dynamics. Mathematical Methods in Applied Sciences DOI: 10.1002/mma.2852. PMCID not available [\[PDF\]](#)
170. Liu, Jinn-Liang and Bob Eisenberg. (2013) Correlated Ions in a Calcium Channel Model: A Poisson-Fermi Theory. Journal of Physical Chemistry B 117 (40), 12051-12058. DOI: <http://dx.doi.org/10.1021/jp408330f> doi: 10.1021/jp408330f [PMID: 24024558](#) [\[PDF\]](#)

171. Tindjong, R., Kaufman, I., Luchinsky, D. G., McClintock P.V.E., Khovanov, I., Eisenberg, R.S. (2013) Self-organized enhancement of conductivity in biological ion channels *New J. Phys.* 15 p.1-10. PMID not available [[PDF](#)]
172. Dreyer, J.; Strodel, P.; Ippoliti, E.; Finnerty, J.; Eisenberg, B.; Carloni, P. (2013) Ion Permeation in the NanC Porin from *Escherichia coli*: Free Energy Calculations along Pathways Identified by Coarse-Grain Simulations. *The Journal of Physical Chemistry B* 2013. Available on line with doi: 10.1021/jp4081838 [PMID: 24147565](#) [[PDF](#)]
173. Kaufman, I., D.G. Luchinsky, R. Tindjong, P.V.E. McClintock, R.S. Eisenberg. (2013) Energetics of discrete selectivity bands and mutation-induced transitions in the calcium-sodium ion channels family. *Physical Review E.* 88, 052712 (2013) [PMID: 24329301](#) [[PDF](#)] Also available at <https://arxiv.org/abs/1305.1847>.
174. Lin, Tai-Chia, and Bob Eisenberg. (2014) A new approach to the Lennard-Jones potential and a new model: PNP-steric equations. *Communications in Mathematical Sciences* 12(1) pp. 149–173. PMID not available [[PDF](#)]
175. Flavell, Alan, Machen, Michael, Eisenberg, Bob, Kabre, Julienne, Liu, Chun, Li, Xiaofan. (2014) A Conservative Finite Difference Scheme for Poisson-Nernst-Planck Equations *Journal of Computational Electronics J Comput Electron* (2014) 13:235–249 DOI 10.1007/s10825-013-0506-3. PMID not available [[PDF](#)], also see earlier version posted on <https://arxiv.org> with Paper ID [arXiv 1303.3769v1](https://arxiv.org/abs/1303.3769v1) [[PDF](#)]
176. Berti, Claudio, Furini, Simone, Gillespie, Dirk, Boda, Dezso, Eisenberg, Robert S., Sangiorgi, Enrico, and Claudio Fiegna. (2014) Three-Dimensional Brownian Dynamics Simulator for the Study of Ion Permeation through Membrane Pores. *JCTC: Journal of Chemical Theory and Computation* 10: 2911-2926. [dx.doi.org/10.1021/ct4011008](https://doi.org/10.1021/ct4011008) [[PDF](#)] and [[PDF](#)]. BROWNIan Ion channel and Electrolyte Simulator (BROWNIES) is at [[PDF](#)].
177. Liu, Jinn-Liang, Bob Eisenberg. (2014) Analytical Models of Calcium Binding in a Calcium Channel *Journal of Chemical Physics* 141, 075102 (2014); doi: 10.1063/1.4892839 [[PDF](#)]
178. Lin, Tai-Chia, Bob Eisenberg. (2014) Multiple solutions of steady-state Poisson-Nernst-Planck equations with steric effects. Published Aug 1, 2014 in <https://arxiv.org> with Paper ID [arXiv:1407.8252v1](https://arxiv.org/abs/1407.8252v1) [[PDF](#)]
179. Liu, Jinn-Liang, Bob Eisenberg (2014) Poisson-Nernst-Planck-Fermi Theory for Modeling Biological Ion Channels. *Journal of Chemical Physics* 141 22D532 doi:<http://dx.doi.org/10.1063/1.4902973> [[PDF](#)] available on <https://arxiv.org> with Paper ID in <https://arxiv.org> with Paper ID [arXiv:1506.06203](https://arxiv.org/abs/1506.06203) [[PDF](#)]
180. Eisenberg, Robert, Liu, Weishi, Xu, Hongguo. (2015). Reversal permanent charge and reversal potential: case studies via classical Poisson-Nernst-Planck models. *Nonlinearity* 28 (2015) 103–127 doi:10.1088/0951-7715/28/1/103. [[PDF](#)]
181. Boda, Dezsó, Leaf, Gary, Fonseca, Jim, Eisenberg, Bob. (2015) Energetics of ion competition in the DEKA selectivity filter of neuronal sodium channels. *Condensed Matter Physics*, 18, No 1, 13601: 1–14 [[PDF](#)]

182. Lin, Tai-Chia, Bob Eisenberg (2015) Multiple solutions of steady-state Poisson-Nernst-Planck equations with steric effects. *Nonlinearity* 28 2053-2080 [[PDF](#)]
183. Liu, Jinn-Liang, Bob Eisenberg (2015) Numerical Methods for Poisson-Nernst-Planck-Fermi Model *Physical Review E*, 92, 012711 [[PDF](#)]. Also available on the arXiv as [arXiv:1506.05953](https://arxiv.org/abs/1506.05953) [[PDF](#)].
184. Liu, Jinn-Liang and Bob Eisenberg. (2015) Poisson-Fermi Model of Single Ion Activities in Aqueous Solutions. *Chemical Physics Letters*, *Frontiers Article*. 637: p. 1-6. [[PDF](#)]. Posted on <https://arxiv.org> with paper ID [arXiv:1506.07780](https://arxiv.org/abs/1506.07780) [[PDF](#)]
185. Kaufman, I., McClintock, P.V.E, and R.S. Eisenberg. (2015) Coulomb blockade model of permeation and selectivity in biological ion channels. *New Journal of Physics* 17: 083021 [[PDF](#)] with Video Abstract at <https://vimeo.com/133018475> Password is physics
186. Kaufman, I., D. G. Luchinsky, W. A. Gibby, P. V .E. McClintock, and R.S. Eisenberg. (2016) Putative resolution of the EEEE selectivity paradox in L-type  $\text{Ca}^{2+}$  and bacterial  $\text{Na}^{+}$  biological ion channels *JStat: Journal of Statistical Mechanics: Theory and Experiment* doi:10.1088/1742-5468/2016/05/054027. [[PDF](#)]
187. Liu, Jinn-Liang, Hann-jeng Hsieh and Bob Eisenberg (2016). Poisson–Fermi Modeling of the Ion Exchange Mechanism of the Sodium/Calcium Exchanger. *The Journal of Physical Chemistry B* 120(10): 2658-2669. [[PDF](#)]
188. Xie, Dexuan, Jinn-Liang Liu, and Bob Eisenberg (2016). A Nonlocal Poisson-Fermi Model for Ionic Solvent. Available on <https://arxiv.org> with Paper ID [arXiv: 1603.05597](https://arxiv.org/abs/1603.05597). [[PDF](#)]
189. Xie, Dexuan, Jinn-Liang Liu, Bob Eisenberg, and L. Ridgway Scott (2016). Nonlocal Poisson-Fermi model for ionic solvent. *Physical Review E* 94 012114 [different version and authorship from ref. 188] [[PDF](#)]
190. Eisenberg, R. S. (2016). Mass Action and Conservation of Current. *Hungarian Journal of Industry and Chemistry* 44(1): 1-28 Posted on <https://arxiv.org> with paper ID [arXiv:1502.07251](https://arxiv.org/abs/1502.07251). [[PDF](#)]
191. Ji, Shuguan, Eisenberg Bob, and Weishi Liu (2017). Flux ratios and channel structure. *Journal of Dynamics and Differential Equations (JDDE)* <https://doi.org/10.1007/s10884-017-9607-1> [[PDF](#)] Preprint available on [arXiv: 1612.08742](https://arxiv.org/abs/1612.08742). [[PDF](#)].
192. Kaufman, I. Kh., Fedorenko, O. A., Luchinsky, D.G., Gibby, W.A.T., Roberts, S.K., McClintock, P.V.E., and RS Eisenberg (2017). Ionic Coulomb blockade and anomalous mole fraction effect in NaChBac bacterial ion channels. *Nonlinear Biomed. Phys.* 5, 4 DOI: 10.1051/epjnbp/2017003 Posted on <https://arxiv.org> with paper ID [arXiv: 1612.02744](https://arxiv.org/abs/1612.02744). [[PDF](#)]
193. Liu, Jinn-Liang, Dexuan Xie and Bob Eisenberg (2017). Poisson-Fermi Formulation of Nonlocal Electrostatics in Electrolyte Solutions. *Mol. Based Math. Biol.* 5:116–124 [[PDF](#)]. Posted on <https://arxiv.org> with arXiv preprint [arXiv:1703.08290](https://arxiv.org/abs/1703.08290). [[PDF](#)]



194. Eisenberg, Bob, Xavier Oriols and David Ferry (2017). Dynamics of Current, Charge, and Mass. *Molecular Based Mathematical Biology* doi:10.1515/mlbmb-2017-0006 [PDF] and arXiv preprint <https://arxiv.org/abs/1708.07400>. [PDF]
195. Eisenberg, Bob and Weishi Liu (2017). Relative dielectric constants and selectivity ratios in open ionic channels. *Molecular Based Mathematical Biology* 5(1)1 125-137 [PDF] available on arXiv at <https://arxiv.org> as <https://arxiv.org/abs/1710.00090>
- 196-1. Zhang, Liwei, Bob Eisenberg, and Weishi Liu (2017). An effect of large permanent charge: Decreasing flux to zero with increasing transmembrane potential to infinity. Available on arXiv as <https://arxiv.org/abs/1712.06666> [PDF]
- 196-2. Zhang, Liwei, Bob Eisenberg, and Weishi Liu. *note date:* (2019). An effect of large permanent charge: Decreasing flux to zero with increasing transmembrane potential to infinity. *European Physical Journal Special Topics*. **227**: p. 2575-2601 [PDF]
197. Liu, Jinn-Liang, and Bob Eisenberg (2018). Poisson-Fermi Modeling of Ion Activities in Aqueous Single and Mixed Electrolyte Solutions at Variable Temperature. *Journal of Chemical Physics* 148: 054501, DOI: 10.1063/1.5021508. [PDF] Available on arXiv at <https://arxiv.org> in 2017 as [arXiv:1801.03470](https://arxiv.org/abs/1801.03470) [PDF]
198. Eisenberg, Bob (2018). Asking Biological Questions of Physical Systems: the Device Approach to Emergent Properties. *Journal of Molecular Liquids* 270: 212 <https://doi.org/10.1016/j.molliq.2018.01.088>, [PDF]. Preprint available on arXiv as <https://arxiv.org/abs/1801.05452> [PDF]
199. Gavish, Nir, Liu, Chun, and Robert Eisenberg (2018) Do Bi-Stable Steric Poisson-Nernst-Planck Models Describe Single Channel Gating? *J. Phys. Chem. B* 2018, 122, 5183–5192 (DOI: 10.1021/acs.jpcc.8b00854). [PDF] available on arXiv as <https://arxiv.org/abs/1805.06851>
200. Eisenberg, Bob, Gold, Nathan, Song, Zilong, and Huaxiong Huang. (2018) What current flows through a resistor? Available on arXiv as <https://arxiv.org/abs/1805.04814> [PDF]
201. Xu, Shixin, Bob Eisenberg, Zilong Song, Huaxiong Huang (2018) Osmosis through a Semi-permeable Membrane: a Consistent Approach to Interactions. Available on the physics arXiv at <https://arxiv.org/abs/1806.00646> [PDF]
202. Nissen, Per, and Bob Eisenberg. (2018) Profiles for ion activities are multiphasic, not curvilinear. Available on the physics arXiv at <https://arxiv.org/abs/1807.07125> [PDF]
203. X. Yang, Y. Gong, J. Li, R. S. Eisenberg, and Q. Wang (2019) Quasi-incompressible multi-species ionic fluid models. *J Molecular Liquids* 273: 677-691 DOI: 10.1016/j.molliq.2018.10.033 [PDF] available on the physics arXiv as 1811.02665 at <https://arxiv.org/abs/1811.02665> [PDF]
204. Horng, Tzyy-Leng, Eisenberg, Robert S., Liu, Chun, Bezanilla, Francisco. (2019) Continuum gating current models computed with consistent interactions. *Biophysical Journal*, 116, 270-282 [PDF] Posted in 2017 at <https://arxiv.org> as preprint [arXiv:1707.02566](https://arxiv.org/abs/1707.02566). [PDF]

205. Zhu, Yi, Shixin Xu, R.S. Eisenberg, and Huaxiong Huang. (2019)  
A Bidomain Model for Lens Microcirculation. *Biophysical Journal*, 116, 1171-1184  
[PDF] <https://doi.org/10.1016/j.bpj.2019.02.007>. Preprint available on the physics arXiv  
at <https://arxiv.org/abs/1810.04162> [PDF]
206. Eisenberg, Robert S. (2019) Dielectric Dilemma.  
Available on the physics arXiv at <https://arxiv.org/abs/1901.10805> [PDF]
207. Eisenberg, Robert S. (2019)  
Updating Maxwell with Electrons, Charge and More Realistic Polarization.  
Preprint available on the physics arXiv at <https://arxiv.org/abs/1904.09695v7> [PDF]
208. Eisenberg, Robert S. (2019)  
Kirchhoff's Law Can be Exact.  
Preprint available on the physics arXiv at <https://arxiv.org/abs/1905.13574> [PDF]
209. Eisenberg, Bob, Weishi Liu, Hamid Mofidi (2020)  
Effects of diffusion coefficients on reversal potentials in ionic channels.  
*Entropy* (2020) 22, 325; doi:10.3390/e22030325 [PDF] [PDF].  
Preprint available on the physics arXiv (2019) at <https://arxiv.org/abs/1912.06713>
210. Willow, Soohaeng Yoo; Xie, Bing ; Lawrence, Jason; Eisenberg, Robert S., Minh, David L.  
(2020) On the Polarization of Ligands by Proteins. *Physical Chemistry Chemical  
Physics* (PCCP) <https://doi.org/10.1039/D0CP00376J> [PDF].  
Preprint available on the physics arXiv at <https://arxiv.org/abs/2001.08326> [PDF]
211. Wang, Yiwei; Liu, Chun; Liu, Pei; and Bob Eisenberg. (2020) Field Theory of Reaction-  
Diffusion: Mass Action with an Energetic Variational Approach. *Physical Review E*  
102:062147 [PDF] Preprint available at <https://arxiv.org/abs/2001.10149> [PDF]
212. Eisenberg, Robert S. (2020) Electrodynamics Correlates Knock-on and Knock-off: Current  
is Spatially Uniform in Ion Channels.  
Preprint on the physics arXiv at <https://arxiv.org/abs/2002.09012v3> [PDF]
213. Liu, Jinn Liang and Bob Eisenberg. (2020) Molecular Mean-Field Theory of Ionic  
Solutions: a Poisson-Nernst-Planck-Bikerman Model.  
*Entropy*, 22, 550; doi:10.3390/e22050550 [PDF].  
Preprint available on the physics arXiv at <https://arxiv.org/pdf/2004.10300.pdf> [PDF]
214. Catacuzzeno, L., L. Sforza, F. Franciolini, and R. Eisenberg. (2020) Why are voltage gated  
Na channels faster than K channels?: one multi-scale hierarchical model.  
Preprint available on the bioRxiv as document [bioRxiv:2020.2005.2011.088559](https://doi.org/10.1101/2020.05.20.110885)  
[PDF] See publication 221 below.
215. Eisenberg, Robert S. (2020) Maxwell Equations for Material Systems.  
DOI: 10.20944/preprints202011.0201.v2 [PDF]
216. Zhu, Y., S. Xu, R. S. Eisenberg, and H. Huang. (2020) A Tridomain Model for Potassium  
Clearance in Optic Nerve of Necturus. arXiv:2012.03303 [PDF] See ref [220] for  
published version in *Biophysical Journal*.

217. Chen, R.-C., C.-L. Li, J.-H. Chen, B. Eisenberg, and J.-L. Liu. (2020) Differential Capacitance of Electric Double Layers: A Poisson-Bikerman Formula, Version 2 Available at <https://arxiv.org/pdf/2012.13141.pdf> [PDF]
218. Eisenberg, Robert S. (2020). Thermostatistics vs. Electrodynamics DOI: 10.20944/preprints202009.0349.v2 [PDF]
219. Catacuzzeno, L., F. Franciolini, F. Bezanilla, and R. Eisenberg. (2021) Gating current noise produced by Brownian models of a voltage sensor. bioRxiv 2021.01.13.426543; doi: <https://doi.org/10.1101/2021.01.13.426543> Biophysical Journal, 120, 1–19, DOI:<https://doi.org/10.1016/j.bpj.2021.08.015>. [PDF]
220. Zhu, Y., S. Xu, R. Eisenberg, and H. Huang. (2021) A Tridomain Model for Potassium Clearance in Optic Nerve of Necturus Biophysical Journal, Vol. 120 Issue 15 Pages 3008-3027 DOI: <https://doi.org/10.1016/j.bpj.2021.06.020> [PDF]; see paper 216 for preprint versions.
221. Catacuzzeno, L., L. Sforza, F. Franciolini, and R. Eisenberg. (2021) Multiscale modeling shows that dielectric differences make NaV channels faster than KV channels. Journal of General Physiology 153. doi:10.1085/jgp.202012706 [PDF] See publication 214 above. [PDF]
222. Zhu, Y., S. Xu, R. S. Eisenberg, and H. Huang. (2021) Optic Nerve Microcirculation: Fluid Flow and Electro-Diffusion. Physics of Fluids, 33, 041906 [PDF] doi: 10.1063/5.0046323, On the arXiv at <https://arxiv.org/abs/2101.12152>. [PDF]
223. Eisenberg, R. S. (2021) Maxwell Equations Without a Polarization Field, Using a Paradigm from Biophysics. Entropy 23 p.172 <https://doi.org/10.3390/e23020172> On the arXiv at <https://arxiv.org/abs/2009.07088> [PDF]
224. Zhu, Y., S. Xu, R. S. Eisenberg, and H. Huang. (2021) Membranes in Optic Nerve Models arXiv preprint arXiv:2105.14411. [PDF]
225. The journal version differs significantly from the arXiv preprint ref 225a. Important extra material is in the arXiv version.
- 225a: Wang, Yiwei., Liu, Chun, and B. Eisenberg (2021) On variational principles for polarization in electromechanical systems. arXiv preprint arXiv:2108.11512. [PDF]
- 225b: Wang, Yiwei. Liu, Chun and B. Eisenberg (2022) On variational principles for polarization in electromechanical systems. Com Math Sci 20(6):1541-1550 [PDF].
226. Xu, Shixin, Eisenberg, Robert, Song, Zilong, Huang, Huaxiong. (2022) Mathematical Model for Chemical Reactions in Electrolyte Applied to Cytochrome c Oxidase: an Electro-osmotic Approach. 048550/arxiv220702215 [PDF]
227. Eisenberg, Robert, Oriols, Xavier, Ferry, David K. (2022) Kirchhoff's Current Law with Displacement Current, On the arXiv as arXiv:2207.08277 [PDF]

228. Song Z, Eisenberg R, Xu S, Huang H. (2023) A Bubble Model for the Gating of Kv Channels. IMA Journal of Applied Mathematics 88, 805–836  
<https://doi.org/10.1093/imamat/hxae002> [PDF]  
arXiv preprint <https://arxiv.org/abs/2204.13077> [PDF]
229. Nicholson, Stanley, D. Minh, David and Robert Eisenberg, H-bonds in Crambin: Coherence in an  $\alpha$ -helix (2023), ACS Omega, 8, 13920–13934 [PDF]  
On the arXiv as Version 5 at <https://arxiv.org/ftp/arxiv/papers/2211/2211.16372.pdf> [PDF]
230. Xu, Shixin, Eisenberg, Robert, Song, Zilong, Huang, Huaxiong. (2023) Mathematical models for electrochemistry: Law of mass action revisited arXiv:2305.12165 [PDF]
231. a) Eisenberg, Robert S. (2023) Maxwell's Current in Mitochondria and Nerve.  
arXiv: 2309.05667 [PDF]  
b) Eisenberg, Robert S. (2024) Maxwell's True Current  
Computation 2024, 12(2), 22; DOI: 10.3390/computation12020022 [PDF]
232. Xu, Shixin, Robert Eisenberg, Zilong Song, and Huaxiong Huang. (2023) Mathematical Model for Chemical Reactions in Electrolytes Applied to Cytochrome c Oxidase: An Electro-Osmotic Approach. Computation, 11: 253. [PDF]  
The journal version differs significantly from the arXiv preprint, ref. 226 above.
233. Xu, Shixin, Robert Eisenberg, Zilong Song, and Huaxiong Huang. (2023) Coupled chemical reactions: Effects of electric field, diffusion, and boundary control. Physical Review E 108, 064413 (2023) [PDF] on arXiv as [2305.12165](https://arxiv.org/abs/2305.12165)
234. Song, Zilong, Robert Eisenberg, Shixin Xu, and Huaxiong Huang. (2024)  
A multi-domain model for microcirculation in optic nerve: blood flow and oxygen transport. *Physica D: Nonlinear Phenomena*: 134272 [PDF]. arXiv preprint arXiv: 2401.08853 [PDF]
235. Xu, Shixin, Zilong Song, Robert Eisenberg, and Huaxiong Huang. (2024).  
Interaction of Ionic Solution with Permeable Membranes: a Variational Approach', J. Math. Study, 57: 24-52. [10.4208/jms.v57n1.24.02](https://doi.org/10.4208/jms.v57n1.24.02) [PDF]
236. Ferry, David K., Xavier Oriols, Robert Eisenberg (2024) Displacement Current in Classical and Quantum Systems.  
a) arXiv preprint 2408.13268 [PDF]  
b) published in extended and revised form in  
Computation (2025), 13, 45 DOI 10.3390/computation13020045 [PDF]
237. Xiao, Shanfeng, Huaxiong Huang, Robert Eisenberg, Zilong Song, Shixin Xu (2024)  
Multidomain Model for Optic Nerve Potassium Clearance: Roles of Glial Cells and Perivascular Spaces arXiv preprint:2410.10895v1 [PDF]
- 238 Eisenberg, Robert (2024). Kirchhoff's Current Law and the Continuity Equation.  
*ScienceOpen Preprints*. 2024. DOI: 10.14293/PR2199.001114.v1 [PDF]
239. Robert Eisenberg. Current Flow in Nerve and Mitochondria.

- a) Paper: *ScienceOpen Preprints*. 2024. DOI: 10.14293/PR2199.001212.v1 [[PDF](#)]  
 b) Slide Show: DOI:10.13140/RG.2.2.17542.18242 [[PDF](#)]
240. Eisenberg, Robert S. (2024) *Electrodynamics of Circuits: Version 2*,  
 Doi: 10.14293/PR2199.001299.v2 [[PDF](#)]

**Reviews, mostly invited:**

1. † Eisenberg, R.S. The equivalent circuit of frog skeletal muscle. (1971) In: *Contractility of Muscle Cells* (Ed. R. Podolsky) Prentice Hall, p. 73-88. PMID not available [[PDF](#)]
2. † Eisenberg, R.S. and Mathias, R.T. (1980) Structural analysis of electrical properties of cells and tissues. *Critical Reviews in Bioengineering* 4: 203-232. [PMID: 6256125](#) [[PDF](#)]
3. Eisenberg, R.S. Structural Complexity, Circuit Models, and Ion Accumulation. (1980) *Fed. Proc.* 39: 1540-1543. [PMID: 7364048](#) [[PDF](#)]
4. Mathias, R.T., R.A. Levis, and R.S. Eisenberg. (1981) An alternative interpretation of charge movement in muscle. In: **The Regulation of Muscle Contraction: Excitation-Contraction Coupling**. Ed. A. D. Grinnell & M.A.B. Brazier, Academic Press, New York, pp 39-52. PMID not available [[PDF](#)]
- 5-1. Eisenberg, R.S. (1983) Impedance Measurement of the Electrical Structure of Skeletal Muscle. In: **Handbook of Physiology, Section 10: Skeletal Muscle**, Ed. L.D. Peachey American Physiological Society, pp 301-323. PMID not available [[PDF](#)]
- 5-2. Eisenberg, R.S. (2011) Republished by the American Physiological Society, as part of **Comprehensive Physiology**, Volume 1, Supplement 27 of *Handbook of Physiology*. Online SSN: 20404603; Online ISBN: 9780470650714. Publisher: Wiley On Line Library. DOI doi:10.1002/cphy.cp100111.
6. † Eisenberg, R.S. (1984) Membranes and Channels. *Physiology and Molecular Biology*, pp. 235-283. In: **Membranes, Channels, and Noise**, Eds. R.S. Eisenberg, M. Frank, and C.F. Stevens, Plenum Press, NY. PMID not available [[PDF](#)]
7. Eisenberg, R.S. (1986) Electrical field problems in muscle and their meaning to mathematicians, physiologists, and muscle. *in: Some Mathematical Questions in Biology - Muscle Physiology. Lectures on Mathematics in the Life Sciences, Vol. 16*. Ed., Robert M. Miura, American Mathematical Society, Providence, Rhode Island, 16: 223-234. PMID not available [[PDF](#)]
8. † Eisenberg, R.S. (1987) Impedance measurements as estimators of the properties of the extracellular space. *Ann. NY Acad. Sci.* 481: 116-122. [PMID: 3468851](#) [[PDF](#)]
9. † Rae, J.L., Levis, R.A., and Eisenberg, R.S. (1988) Ionic channels in ocular epithelia. Ch. 8, p. 283-327 *in Ion Channels* (ed. T. Narahashi), Plenum Press. [PMID: 2485003](#) [[PDF](#)]
10. † Eisenberg, R.S. (1990) Channels as Enzymes. *J. Membrane Biology* 115, 1-12 (1990) [PMID: 1692343](#) [[PDF](#)]. Also available on arXiv as <https://arxiv.org/pdf/1112.2363v2> [[PDF](#)]

11. † Tang, J.M., Wang, J., and Eisenberg, R.S. (1992) Studies on intact sarcoplasmic reticulum: patch clamp recording and tension measurement in lobster split muscle fibers. *in* **Ion Channels** (ed.'s B. Rudy and L.E. Iverson), 207: 692-9 **Methods in Enzymology**. [PMID: 1382208](#) [[PDF](#)]
12. † Tang, J.M., Wang, J., and Eisenberg, R.S. (1992) Perfusing patch pipettes, easily and quietly. *in* **Ion Channels** (ed.'s B. Rudy and L.E. Iverson), 207: 176-181 **Methods in Enzymology**. [PMID: 1528117](#) [[PDF](#)]
13. † Tang, J.M., F.N. Quandt, and R.S. Eisenberg. Perfusion of Patch Pipettes. (1995) *in* **Patch Clamp Techniques and Protocols**. (p.123-140) ed.'s: A.A. Boulton, hG.B. Baker, and W. Walz. Humana Press. PMCID not available [[PDF](#)]
14. † Eisenberg, R.S. (1996a) Atomic Biology, Electrostatics and Ionic Channels. Ch. 5, p. 269-357, in: *New Developments and Theoretical Studies of Proteins*. Edited by Ron Elber in the *Advanced Series in Physical Chemistry*, Vol. 7. World Scientific, Philadelphia. PMCID not available [[PDF](#)] Published July 5, 2008 in <https://arxiv.org> with Paper ID [arXiv:0807.0715](#). [[PDF](#)]
15. Eisenberg, R.S. (1996b). Computing the field in proteins and channels. *J. Membrane Biol.* 150:1-25. [PMID: 8699474](#) [[PDF](#)] Posted on <https://arxiv.org> with Paper ID [arXiv:1009.2857](#), September 15, 2010.
16. Eisenberg, Bob (1998). Ionic channels in biological membranes. *Natural nanotubes*. *Accounts of Chemical Research* 31:117-125. PMCID not available [[PDF](#)]
17. Eisenberg, Bob (1998). *Ionic Channels in Biological Membranes: Natural Nanotubes described by the Drift-Diffusion Equations*. (Invited by and accepted by VLSI Design) *Proceedings of the Fifth International Workshop on Computational Electronics*. 8:75-78, 1997. PMCID not available [[PDF](#)]
18. Eisenberg, Bob (1998). Ionic channels in biological membranes. *Electrostatic analysis of a natural nanotube*. *Contemporary Physics*, 39 (6) 447-466. PMCID not available [[PDF](#)], also available on <https://arxiv.org> with paper ID [arXiv1610.04123](#)
19. Nonner, Wolfgang, Chen, Duan, and Bob Eisenberg. (1999). Progress and prospects in permeation. *Journal of General Physiology* 113: 773-782. [PMCID: PMC2225611](#) [[PDF](#)]
20. Eisenberg, R.S. (1999). From Structure to Function in Open Ionic Channels. *Journal of Membrane Biology* 171 1-24. [PMID: 10485990](#) [[PDF](#)] Posted on <https://arxiv.org> with Paper ID [arXiv: 1011.2939](#)
21. Nonner, Wolfgang, and Bob Eisenberg. (2000) *Electrodifusion in Ionic Channels of Biological Membranes*. *Journal of Molecular Liquids* 87:149-162. PMCID not available [[PDF](#)]
22. Eisenberg, Bob. (2000). *Permeation as a Diffusion Process*. Chapter 4 in **Biophysics Textbook On Line “Channels, Receptors, and Transporters”** Louis J. DeFelice, Volume Editor. Location Updated on November 18, 2005 PMCID not available [[PDF](#)] Published July 5, 2008 in <https://arxiv.org> with Paper ID [arXiv: 0807.0721](#). [[PDF](#)] Original Biophysical Society publication is found at [Original](#) and [Original 2](#).

23. Eisenberg, R. (2000) Ionic channels: natural nanotubes described by the drift diffusion equations. *Superlattices and Microstructures*. 27 (5/6) 545-549. PMID not available [[PDF](#)]
24. Eisenberg, Bob. (2003) Proteins, Channels, and Crowded Ions *Biophysical Chemistry* 100: 507 - 517. [Edsall Memorial Volume] PMID not available [[PDF](#)]
- 24a. Eisenberg, Bob. (2003) Erratum to “Proteins, channels and crowded ions”, *Biophysical Chemistry* 106 p.93. [N.B., note misprint in title of Erratum in initial, i.e., left quotation marks!] [PMID: 12646387](#) [[PDF](#)]
25. Schuss, Zeev, Nadler, Boaz, Singer, Amit, and Eisenberg, Robert S. Eisenberg. (2002) A PDE formulation of non-equilibrium statistical mechanics for ionic permeation, AIP Conference Proceedings 665, Washington, DC, 3-6 September 2002: *Unsolved Problems Of Noise And Fluctuations*, UPoN 2002, 3rd International Conference on Unsolved Problems of Noise and Fluctuations in Physics, Biology, and High Technology (S.M. Bezrukov, ed.), p.312, Washington, DC. PMID not available [[PDF](#)]
26. Eisenberg, Bob. (2002) Ionic channels as natural nanodevices. *J. Computational Electronics* 1 331-334. PMID not available [[PDF](#)]
27. Eisenberg, Bob. (2003) Ion channels as devices. *J. Computational Electronics* 2 245-249. PMID not available [[PDF](#)]
28. Eisenberg, Bob. (2005) Living Transistors: a Physicist’s View of Ion Channels. Posted on <https://arxiv.org> with Paper ID [arXiv: q-bio/0506016v2](https://arxiv.org/abs/q-bio/0506016v2), June 14, 2005. version 2 August 25, 2005, posted Feb 3 2008. PMID not available [[PDF](#)]. This paper was modified for later publication as: *Ions in Fluctuating Channels: Transistors Alive in Fluctuation and Noise Letters* (2012) 11: 76-96, available on <https://arxiv.org> with Paper ID [arXiv: q-bio/0506016v3](https://arxiv.org/abs/q-bio/0506016v3), version 3. [[PDF](#)]
29. Saraniti, Marco, Aboud, Shela, and Robert Eisenberg. (2006) The Simulation of Ionic Charge Transport in Biological Ion Channels: an Introduction to Numerical Methods. *Reviews in Computational Chemistry Vol 22*, pp 229-294. PMID not available [[PDF](#)]
30. Eisenberg, Bob. (2008) Ion channels allow atomic control of macroscopic transport. *Physica Status Solidi (c)* 5, 708–713 (2008) /DOI 10.1002/pssc.200777556. PMID not available [[PDF](#)]
31. Eisenberg, Bob. (2010). Crowded Charges in Ion Channels. *Advances in Chemical Physics* (Stuart Rice, Editor), *Adv. Chem. Phys.* v. 148, pp. 77-223. Posted on <https://arxiv.org> with Paper ID [arXiv:1009.1786v1](https://arxiv.org/abs/1009.1786v1), September 9, 2010. PMID not available [[PDF](#)]  
  
Eisenberg, Robert S. (2011) *see paper 5 of **Reviews** in this CV*. Republished by the American Physiological Society, as part of **Comprehensive Physiology**, Volume 1, Supplement 27 of *Handbook of Physiology*. Online SSN: 20404603; Online ISBN: 9780470650714. Publisher: Wiley On Line Library. DOI doi:10.1002/cphy.cp100111.
32. Eisenberg, Bob. (2011) Life’s Solutions are Not Ideal. Posted on <https://arxiv.org> with Paper ID [arXiv:1105.0184v1](https://arxiv.org/abs/1105.0184v1), May 3, 2011. PMID not available [[PDF](#)]

33. Eisenberg, Bob. (2011) Mass Action in Ionic Solutions. *Frontiers Article*, and cover of *Chemical Physics Letters*, 511 p. 1-6. doi: 10.1016/j.cplett.2011.05.037 [PMCID: PMC3142660](#) *Note misprint in address. should be Rush University.* [\[PDF\]](#)
34. Eisenberg, Bob. (2012) Ions in Fluctuating Channels: Transistors Alive. *Fluctuation and Noise Letters*. 11:76-96 [PMCID not available](#) [\[PDF\]](#) available on <https://arxiv.org> with Paper ID arXiv:q-bio/0506016v3, i.e., version 3. [\[PDF\]](#) The earlier version is available on <http://https://arxiv.org/> as [arXiv:q-bio/0506016v2](#). [\[PDF\]](#)
35. Eisenberg, Bob. (2012) Ion Channels, in *Encyclopedia of Applied Electrochemistry* (Springer), (*in the press*), Editors: R. Savinell, K. Ota, and G. Kreysa, Topical editor W. Kunz. Available at <http://https://arxiv.org/abs/1206.1253> as [arXiv:1206.1253v1](#). [PMCID not available](#) [\[PDF\]](#)
36. Eisenberg, Bob. (2012) Living Devices. The Physiological Point of View. Available at <http://https://arxiv.org/abs/1206.6490> as [arXiv:1206.6490v2](#). [PMCID not available](#) [\[PDF\]](#)
37. Eisenberg, Bob. (2012) Life's Solutions. Mathematical Challenge. Available at <http://https://arxiv.org/abs/1207.4737> as [arXiv:1207.4737v2](#). [PMCID not available](#) [\[PDF\]](#)
38. Eisenberg, Bob. (2012) A Leading Role for Mathematics in the Study of Ionic Solutions. *SIAM News*, Volume 45, Number 9 (November), p. 12-11 (*sic*). [PMCID not available](#) [\[PDF\]](#)
39. Eisenberg, Bob. (2013) Ionic Interactions are everywhere. *Physiology* (a journal of the American Physiological Society) 28:28-38. doi: 10.1152/physiol.00041.2012 [PMID: 23280355](#) [\[PDF\]](#)
40. Eisenberg, Bob. (2013) Ionic interactions in biological and physical systems: A variational treatment. *Faraday Discussions.*, 160 (1), 279 – 296 DOI:10.1039/C2FD20066J Available with significant corrections of typos in equations at <https://arxiv.org/abs/1206.1517> as [arXiv:1206.1517v2](#). doi:10.1039/C2FD20066J [PMID: 23795506](#) [\[PDF\]](#)
41. Eisenberg, Bob. (2013) Interacting ions in Biophysics: Real is not ideal. *Biophysical Journal* **104**:1849. doi: 10.1016/j.bpj.2013.03.049 [PMCID: PMC3647150](#) [\[PDF\]](#) Also available at <https://arxiv.org/abs/1305.2086> as [arXiv:1305.2086](#). [\[PDF\]](#) and at PubMed Central PMC 3647150
42. Eisenberg, R. (2015) Single Ion Channels. In **Discoveries in Modern Science: Exploration, Invention, Technology**. J. Trefil, editor. Macmillan Reference USA. Farmington Hills, MI. 1006-1010 [\[PDF\]](#)
43. Eisenberg, B. (2016) Mass Action and Conservation of Current. *HJIC: Hungarian Journal Of Industry And Chemistry* 44(1): 1-28 Posted on <https://arxiv.org> with paper ID [arXiv:1502.07251](#) [\[PDF\]](#)



44. Eisenberg, Robert. (2018) Electrical Structure of Biological Cells and Tissues: impedance spectroscopy, stereology, and singular perturbation theory in “**Impedance Spectroscopy: Theory, Experiment, and Applications. Third Edition.** Editors: Evgenij Barsoukov, J. Ross Macdonald, Wiley-Interscience. Ch. 4.7, p. 472-478. Available on arXiv at <https://arxiv.org/abs/1511.01339> as [arXiv:1511.01339](https://arxiv.org/abs/1511.01339). [\[PDF\]](#)
45. Eisenberg R. (2022) Meeting Doug Henderson. Journal of Molecular Liquids. 361:119574. [\[PDF\]](#)
46. Eisenberg R. (2023) Structural Analysis of Fluid Flow in Complex Biological Systems. Modeling and Artificial Intelligence in Ophthalmology. 4:1-10  
Doi: <https://doi.org/10.35119/maio.v4i1.126> [\[PDF\]](#)  
preprint at 10.20944/preprints202205.0365.v1 [\[PDF\]](#)
47. Eisenberg B. (2022) Setting Boundaries for Statistical Mechanics, Version 2: MDPI: Molecules. Molecules (journal). 27:8017. [\[PDF\]](#)  
Extensively and revised version of item numbered ‘57.’ in ‘*Everything Else*’, see first version, in *Publications*, p 29, and at <https://arxiv.org/abs/2112.12550>
48. Eisenberg, Robert (2023). Circuits, Currents, Kirchhoff, and Maxwell. Qeios ID: L9QQSH.3; DOI: [10.32388/L9QQSH.3](https://doi.org/10.32388/L9QQSH.3) [\[PDF\]](#)
49. Eisenberg, Bob (2025). True on All Scales: A Tribute to Stuart Rice. DOI: [10.13140/RG.2.2.11167.47522](https://doi.org/10.13140/RG.2.2.11167.47522) [\[PDF\]](#)

### ***Everything Else:***

1. Eisenberg, R.S. (1975) Electrophysiology. A review of **Electric Current Flow in Excitable Cells**. J.B. Jack, D. Noble and R.W. Tsien. Clarendon (Oxford University Press), New York, 1975, xvi, 502pp. Science, 190, p. 1087. PMID not available [\[PDF\]](#)
2. Eisenberg, R.S. (1973) Studies of Biomembranes. Book review of **Perspective in Membranes. A Tribute to Kenneth S. Cole**, D.P. Agin (Ed.) Gordon & Breach, New York 319 pp. 1972, Science 181: 539. PMID not available [\[PDF\]](#)
3. Eisenberg, R.S. (1982) Book review of **The Biophysical Approach to Excitable Systems**. Eds. W.J. Adelman, Jr. and D.E. Goldman, Plenum, New York, Science, 46: 1102-1103. [PMID: 17808485](https://pubmed.ncbi.nlm.nih.gov/17808485/)
4. Eisenberg, R.S. (1987) Gating Current. **Encyclopedia of Neuroscience**, Birkhauser, Boston, MA, p. 449-450. PMID not available
5. Eisenberg, R.S. (1987) Ionic Channels in Membranes. **Encyclopedia of Neurosciences**. Birkhauser, Boston, MA p. 627-628. PMID not available
6. Eisenberg, R.S. (1987) Structural Complexity in Nerve Cells. **Encyclopedia of Neuroscience**, Birkhauser, Boston, MA, p. 741-742. PMID not available
7. Eisenberg, R.S. (1987) Volumes apart. Nature. Scientific Correspondence on a paper of Zimmerberg and Parsegian. 325: 114. PMID not available [\[PDF\]](#)

8. Eisenberg, R.S. (1990) Complexities in solution. *Trends in Biochemical Sciences*, 15:51, A Letter concerning a paper of Payne and Rudnick. [PMID: 2336683](#) [[PDF](#)]
9. Eisenberg, RS. (1992) A unified theory of membrane transport. *in Harvard Class of 1962. Thirtieth Anniversary Report*. Harvard University: Office of the University Publisher, Cambridge, MA. PMID not available [[PDF](#)]
10. Bertl, A., Blumwald, E., Coronado, R., Eisenberg, R., Findlay, G., Gradmann, D., Hille, B., Köhler, K., Kolb, H., MacRobbie, E., Meissner, G., Miller, C. Neher, E., Palade, P. Pantoja, O., Sanders, D., Schroeder, J., Slayman, C., Spanswick, R., Walker, A., and Williams, A. (1992) Electrical measurements on endomembranes. *Science* 258: 873-874. [PMID: 1439795](#) [[PDF](#)]
11. Eisenberg, R.S. (1993) Popper, Wolpert, and Critics. *Nature* 361: 292. PMID not available [[PDF](#)]
- 11.1 Averbuch, A. Z., R. S. Eisenberg, M. Israeli and Z. Schuss (1994). Detecting ionic currents in single channels using wavelet analysis, part I: zero mean Gaussian noise, *SPIE*. [[PDF](#)]
12. Chen, D.; Xu, L.; Tripathy, A.; Meissner, G.; Eisenberg, B. (1997) Rate Constants in Channology. *Appendix to Permeation through the Calcium Release Channel of Cardiac Muscle*. *Biophys. J.* 73 1337-1354. [original paper is also cited in this CV] [PMCID: PMC1181034](#) [[PDF](#)]
13. Eisenberg, Bob (2000) Vignette Applications of Physical Chemistry, a Biological Example. in Berry, Rice, and Ross *Physical Chemistry* (2<sup>nd</sup> Edition, Oxford University Press, p. 1011-1017). PMID not available [[PDF](#)]
14. Eisenberg, Bob (2003) Why can't protons move through ion channels? *Biophysical Journal* 85(6): 3427-3428. [PMCID: PMC1303650](#) [[PDF](#)]
15. Tindjong, R., Applegate, A., Eisenberg, R.S. Kaufman, I., Luchinski, D.G., and PVE McClintock. (2004) Ionic current through an open channel: a low-dimensional model of coupling with vibrations of the wall.<sup>†</sup> In D Abbott, SM Bezrukov, A Der, and A Sanchez, Eds. *Fluctuations and Noise in biological, Biophysical, and Biomedical systems II Proc of SPIE 5467, 2004 338-344*. (Proceedings of Conference in Maspalomas, May 2004). PMID not available [[PDF](#)]
16. Patent Application, PCT/NL2003/000013 Liquid Based Electronic Device (from BioMade, Groningen, Netherlands.) Patent Application was subsequently withdrawn, but it is an interesting idea, nonetheless, in my biased view, PCT/NL2003/000013 Liquid Based Electronic Device (from BioMade, Groningen, Netherlands.) PMID not available [[PDF](#)]
17. Tindjong, R, Eisenberg, R.S. Kaufman, I., Luchinski, D.G., and PVE McClintock. (2005). Brownian dynamics simulation of ionic current through an open channel.<sup>†</sup> In T Gonzalez, J. Mateo, and D. Pardo, Eds *Proc of AIP Conference 780 p. 563-566*. (Proceedings of the 18<sup>th</sup> International Conference on Noise and Fluctuations Salamanca, Spain Sept, 2005). PMID not available [[PDF](#)]

18. Eisenberg, Bob (2005). Validating the need to validate code. *Physics Today* (Letter to the Editor) 58 (8) p. 13. PMID not available [PDF]
19. Eisenberg, Bob (2006). The value of Einstein's mistakes. "Einstein should be allowed his mistakes ..." *Physics Today* (Letter to the Editor) 59 (4) p.12. PMID not available [PDF]
20. Eisenberg, Bob (2007). New and Notable: Mechanical Spikes from Nerve Terminals. *Biophysical Journal* 92 p. 2983. doi: 10.1529/biophysj.107.104364 [PMCID: PMC1852345](#) [PDF]
21. Eisenberg, R.S. (2007) Look at biological systems through an engineer's eyes. *Nature* Vol 447, p. 376. [PMID: 17522654](#) [PDF]
22. Patent Application, U.S. Patent Application 12/297,179 Mathematical Design of Ion Channel Selectivity via Inverse Problems Technology (with Heinz Engl and Martin Burger, from Rush University Medical Center.) PMID not available [PDF]
23. Eisenberg, Bob. (2008) Understanding Life with Molecular Dynamics and Thermodynamics: Comment on *Nature* 451, 240-243 (2008). Posted on <https://arxiv.org> with Paper ID [arXiv:0802.2244v2](https://arxiv.org/abs/0802.2244v2) PMID not available [PDF]
24. Eisenberg, B. (2008) Engineering channels: Atomic biology. *Proc. Natl. Acad. Sci. U. S. A.* 2008 105: p. 6211-6212. doi: 10.1073/pnas.0802435105 [PMCID: PMC2359799](#) [PDF]
25. Eisenberg, B. (2008) Grappling With the Cosmic Questions. Letter to the Editor. *New York Times*, May 15, p. A30. PMID not available [PDF]
26. Luchinsky, D.G., Tindjong, R., Kaufman, I. McClintock, P.V.E., R.S. Eisenberg. (2008) Charge fluctuations and their effect on conduction in biological ion channels.<sup>†</sup> Posted on <https://arxiv.org> with Paper ID <https://arxiv.org/abs/0807.0838v1> PMID not available [PDF]
27. Eisenberg, B. (2008) Ionic Selectivity in Channels: complex biology created by the balance of simple physics. *Nanotechnology 501 Lecture Series: Purdue University.: Nanohub Purdue University.* <http://www.nanohub.org/resources/4726/> PMID not available [PDF]
28. Eisenberg, B. (2009) Self organized model of selectivity. Available online from Institute for Mathematics and its Applications (IMA) University of Minnesota at [Self-Organized IMA link](#) and posted on <https://arxiv.org> with Paper ID <https://arxiv.org/abs/0906.5173> PMID not available [PDF]
29. Eisenberg, B. (2010) Ion Channels and Selectivity. Kavli Institute of Theoretical Physics. University of California Santa Barbara. Seminar Slides on-line at <http://online.kitp.ucsb.edu/online/evocell10/eisenberg> PMID not available
30. Bardhan, Jaydeep P., Leaf, Gary K. and Bob Eisenberg. (2010) Reproducible Estimation of Osmotic Coefficients Using the Inverse Monte Carlo Method. Argonne National Laboratory Mathematics and Computer Science Preprint ANL-MCS P1764-0610 PMID not available [PDF]

31. Eisenberg, Bob. (2010) CSO Deserves Immense Credit. Letter to the Editor, Chicago Tribune, June 4. PMID not available [PDF]
32. Eisenberg, Bob, Hyon, YunKyong, and Chun Liu. (2010) Energy variational analysis EnVarA of ions in water and channels: Field theory for primitive models of complex ionic fluids, Preprint number 2317 of the reprint series of the Institute for Mathematics and its Applications (IMA, University of Minnesota, Minneapolis) <http://www.ima.umn.edu/preprints/jun2010/jun2010.html> [PDF] *Nearly identical to paper 149.* doi: 10.1063/1.3476262 PMID: PMC2949347
33. Hyon, YunKyong, Eisenberg, Bob, and Chun Liu. (2010) A mathematical model for the hard sphere repulsion in ionic solutions Preprint# 2318 of the reprint series of the Institute for Mathematics and its Applications (IMA, University of Minnesota, Minneapolis) <http://www.ima.umn.edu/preprints/jun2010/jun2010.html> PMID not available [PDF]
34. Mori, Yoichiro, Liu, Chun, and RS Eisenberg. (2010) A Model of Electrodifusion and Osmotic Water Flow and its Energetic Structure. Posted on <https://arxiv.org> with Paper ID <https://arxiv.org/abs/1101.5193v1> PMID not available [PDF], See final version in the 'Papers' Section of the Publications List, Number 156.
35. Eisenberg, Bob. (2012) Reduced Models, Sensitivity, and Inverse Problems. Comment on Paul Krugman Blog of the New York Times. PMID not available [PDF] <http://krugman.blogs.nytimes.com/2012/03/02/the-microfoundation-thing-wonkish/#postComment>
36. Eisenberg, Bob. (2013) Electrostatic effects in living cells. *Physics Today* 66:10-11. PMID not available [PDF]
37. Flavell, Alan, Machen, Michael, Eisenberg, Bob, Liu, Chun, Li, Xiaofan. (2013) A Conservative Finite Difference Scheme for Poisson-Nernst-Planck Equations. Posted on <https://arxiv.org> with Paper ID [arXiv:1303.3769v1](https://arxiv.org/abs/1303.3769v1) [PDF]. See revised published version Flavell, Alan, Machen, Michael, Eisenberg, Bob, Kabre, Julianne, Liu, Chun, Li, Xiaofan. (2013) A Conservative Finite Difference Scheme for Poisson-Nernst-Planck Equations. *Journal of Computational Electronics* (*in the press*). PMID not available [PDF] *see item 167, p. 14 of Publications above.*
38. Kaufman, I., McClintock, P.V.E., and R.S. Eisenberg. (2014) Ionic Coulomb Blockade and Resonant Conduction in Biological Ion Channels. Posted on <https://arxiv.org> with paper ID [arXiv:1405.1391](https://arxiv.org/abs/1405.1391) [PDF]
39. Eisenberg, Bob. (2014) Shouldn't we make biochemistry an exact science? Posted on <https://arxiv.org> with paper ID [arXiv:1409.0243](https://arxiv.org/abs/1409.0243) [PDF]
40. Eisenberg, Bob. (2014) Shouldn't we make biochemistry an exact science? *ASBMB Today* 13:36-38. [PDF]
41. Eisenberg, Bob. (2014) The Right Way to Describe Neuronal Activity? *SIAM News* December, p. 5. [PDF]
42. Eisenberg, Bob. (2014) Anomalous Brownian Motion is Expected: Classical Brownian theory describes uncharged particles <https://medium.com/@Bob.Eisenberg/anomalous-brownian-motion-is-expected-2ca41b37970a> [PDF]

43. Eisenberg, Bob. (2016) [Interview](#) at Living History Project of the American Physiological Society: <https://www.youtube.com/watch?v=wj7QiLAv61E>
44. Eisenberg, Bob (2016) Calculus and the Rolling Stones. New York Review of Books, 63(1) January 16, p. [\[PDF\]](#)
45. Eisenberg, Bob (2016) Young Socialists turn into Old Democrats. Letter to Editor Chicago Tribune April 16 2016 [\[PDF\]](#)
46. Eisenberg, Bob (2016) Electricity is Different, [Slides of talk](#) at Penn State Mathematics, August 9, 2016. [\[PDF<sub>1</sub>\]](#) [\[PDF<sub>2</sub>\]](#)
47. Eisenberg, Bob (2016) Maxwell Matters.  
Available on arXiv as <https://arxiv.org/abs/1607.06691> [\[PDF\]](#)
48. Eisenberg, Bob. (2016) Conservation of Charge and Conservation of Current. Available on arXiv as <https://arxiv.org/abs/1609.09175> [\[PDF\]](#)
49. Eisenberg, Bob. (2017) Conservation of Current in three and five slides. Presentation DOI: 10.13140/RG.2.2.12662.91207 [\[PDF\]](#) and DOI: 10.13140/RG.2.2.34473.29284 [\[PDF\]](#) published by Research Gate <https://www.researchgate.net/> Available on Slideshare and Slideserve.
50. Eisenberg, Bob. (2018) Brilliant Stimulation, one cell at a time. Biophysical Journal. New and Notable. 114:256-258. DOI: 10.1016/j.bpj.2017.12.009 [\[PDF\]](#)
51. Eisenberg, Robert (2019) Can we stop climate change? New Yorker Magazine, September 30, 2019 issue, Letter to the Editor, p. 3, [\[PDF\]](#) [Link](#)
52. Eisenberg, Robert S. (2019) What is in a name: PNP. Version 2.  
Preprint available on the engineering arXiv as [10.31224/osf.io/2739d](https://arxiv.org/abs/10.31224/osf.io/2739d) [\[PDF\]](#)
53. Eisenberg, Robert S. (2020) New and Notable. Energetic Controls are Essential. Biophysical Journal 118 1240.  
Preprint available on the physics arXiv as <https://arxiv.org/abs/2002.00200> [\[PDF\]](#)
54. Eisenberg, Robert S. (2021) Core Maxwell Equations are Exact, Universal, and Scary, for that reason. Slide Show: DOI: [10.13140/RG.2.2.24122.31687](https://doi.org/10.13140/RG.2.2.24122.31687)  
Lecture available at <https://tufts.box.com/s/djzpknlbgwdslyffgt53743ky6c3ften>  
Slide Show: DOI: [10.13140/RG.2.2.24122.31687](https://doi.org/10.13140/RG.2.2.24122.31687) [\[PDF\]](#)  
  
Core Maxwell Equations and Conservation of Total Current  
Slide show: <https://doi.org/10.6084/m9.figshare.14892789.v1> [\[PDF\]](#)
55. Eisenberg, Robert S. (2021) Classical Maxwell Equations are Constitutive Laws  
Slide show: DOI: [10.13140/RG.2.2.17301.86244](https://doi.org/10.13140/RG.2.2.17301.86244)
56. Eisenberg, Robert S. (2021) Flushing Waste in the Central Nervous System in Sleep A Glymphatic Hypothesis,  $K^+$  in Optic Nerve of Necturus.  
Slide Show: DOI: [10.13140/RG.2.2.24580.04481](https://doi.org/10.13140/RG.2.2.24580.04481) [\[PDF\]](#)
57. Eisenberg, Bob. (2022) Setting Boundaries for Statistical Mechanics. On the physics arXiv as <https://arxiv.org/abs/2112.12550> [\[PDF\]](#) first version. See the greatly extended and revised version, item numbered ‘47.’ in ***Reviews Section***, see *Publications* p. 25

58. Eisenberg, Bob. (2022) Meeting Doug Henderson, DOI: 10.13140/RG.2.2.30825.77923, invited paper, Journal of Molecular Liquids. [PDF]
59. Eisenberg, Robert. (2022) A Necessary Addition to Kirchhoff's Current Law of Circuits Version 2. engrXiv . DOI: <https://doi.org/10.31224/2234> [PDF]
60. Eisenberg R, Catacuzzeno, L, Franciolini F. (2024) Conformations and Currents Make the Nerve Signal. J. Math. Study 51, pp. 53-70 doi: 10.4208/jms.v57n1.24.03 Preprints DOI: 10.14293/s2199-1006.1.sor-.ppd7mca [PDF]
61. Eisenberg, Robert. H-bonds in Crambin: Coherence in an  $\alpha$ -helix (2022) [PPTX]
62. Eisenberg, Robert (2023) What is Total Current? Workshop in Honor of Dave Ferry at IWCN-2023 Barcelona, Spain. [PDF]

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- "From Maxwell to Mitochondria, a Kirchhoff Computation", Computational Science Seminar Brown University. [PPTX]

### **Books:**

1. Eisenberg, R.S., M. Frank, and C.F. Stevens (eds.) (1984) **Membranes, Channels, and Noise.** Plenum Press, NY, pp. 1-54.

### **Abstracts:**

1. Eisenberg, R.S. and Gage, P.W. (1968) Electrical properties of frog skeletal muscle fibers with disrupted transverse tubules. Biophys. J. 8: A-188.
2. Eisenberg, R.S. and Eisenberg, B. (1968) The extent of disruption of the transverse tubular system in glycerol treated skeletal muscle. Federation Proceedings 27: 247.
3. Eisenberg, R.S. and Gage, P.W. (1968) The surface and tubular membranes of frog sartorius muscle fibers. J. Cell Biol. 39: 39a .
4. Eisenberg, R.S. and Gage, P.W. (1969) The conductance of the surface and tubular membranes of frog sartorius muscle. Biophys. J. 9: A99.
5. Eisenberg, R.S. and Johnson, E.A. (1969) The interpretation of potentials recorded with double-barrel microelectrodes or with a single electrode bridge. Federation Proceedings 28: 397.s
6. Howell, J., Vaughan, P. and Eisenberg, R.S. (1970) Maintenance of resting potentials in glycerol treated muscle fibers. Biophys. J. 10: 75a.

7. Howell, J., Vaughan, P. and Eisenberg, R.S. (1970) Changes in the capacitance of frog skeletal muscle. *Federation Proceedings* 29: 656.
8. Eisenberg, R.S. (1972) The electrical properties of the internal membrane structures of skeletal muscle. *J. Physiol. Soc. Japan.* 34:90.
9. Valdiosera, R., Clausen, C. and Eisenberg, R.S. Impedance of frog skeletal muscle fibers. (1973) *Biophys. Soc. Abst.* 195a.
10. Mobley, B.A., Leung, J. and Eisenberg, R.S. (1974) Longitudinal Impedance of skinned frog muscle fibers. *Federation Proceedings* 33: 401. [PMCID: PMC2203567](#)
11. Peskoff, A. and Eisenberg, R.S. (1974) Influence of extracellular resistance on membrane potential of cells. *Federation Proceeding* 33: 1266.
12. Mathias, R.T., Clausen, C. and Eisenberg, R.S. (1975) Mesh model of the electrical properties of the tubular system of skeletal muscle. *The Physiologist*, 18: August.
13. Clausen, C., Lewis, S.A., Diamond, J.M. and Eisenberg, R.S. (1976) Electrical circuit analysis of tight epithelia by alternating current techniques. *Biophys. J.* 16: 131a.
14. Eisenberg, R.S., Barcion, V. and Mathias, R.T. (1978) Electrical properties of a spherical syncytium. *Biophys. J.* 21: 48a.
15. Mathias, R.T., Rae, J. and Eisenberg, R.S. (1978) Linear electrical properties of the lens of the eye. *Biophys. J.* 21: 48a.
16. Eisenberg, B.R. and Eisenberg, R.S. (1980) *T-SR* Junction in activated muscle. *J. Cell. Biol.* 87: 264a.
17. Eisenberg, R.S. Structural analysis of electrical properties. (1981) *Biophys. J.* 33: 267a,.
18. Eisenberg, R.S., Mathias, R.T., and J.L. Rae. (1982) Series resistance measured by integrals of transients. *Biophys. J.* 37: 63a.
19. Milton, R.L., Mathias, R.T. and R.S. Eisenberg. (1982) Impedance measurements at the pelvic end of frog sartorius muscle fibers. *Biophys. J.* 37: 356a.
20. Hui, C.S., Milton, R.L., and Eisenberg, R.S. (1983) Elimination of charge movement in skeletal muscle by a calcium antagonist. *Biophys. J.* 41: 178a.
21. McCarthy, R.T., Milton, R.L., and Eisenberg, R.S. (1983) Paralysis of skeletal muscle fibers by a calcium antagonist. *Biophys. J.* 41: 178a.
22. Levis, R.A., Mathias, R.T. and Eisenberg, R.S. (1983) Electrical properties of sheep Purkinje strands: Impedance measurements and voltage clamp simulations including electrodiffusion. *Biophys. J.* 41: 308a.
23. Curtis, B.A. and Eisenberg, R.S. A delayed calcium influx related to contraction in frog twitch fibers. (1984) *J. Gen. Physiol.* 84: 36a.
24. Cooper, K.E., McCarthy, R.T., Milton, R.L. and Eisenberg, R.S. (1984) Calcium antagonists modify contraction of skeletal muscle fibers. *Biophys. J.* 45: 232a.
25. Eisenberg, R.S., Curtis, B.A. and McCarthy, R.T. (1984) Calcium uptake and K<sup>+</sup> contractures in paralyzed and contracting muscle fibers. *Biophys. J.* 45: 234a.

26. Eisenberg, R.S. Structural analysis of neuronal integration. (1984) *Biophys. J.* 45: 153a.
27. Curtis, B.A. and Eisenberg, R.S. (1984) A delayed influx related to contraction in frog twitch fibers. *J. Gen. Physiol.* 84: 36a.
28. Curtis, B.A. and Eisenberg, R.S. (1985) Calcium entry and the repriming period of frog twitch fibers. *Biophys. J.* 47: 132a.
29. Eisenberg, R.S. Calcium Signals in Muscle. (1985) *Biophys. J.* 47: 194a.
30. Curtis, B.A. and Eisenberg, R.S. (1985) Calcium ions: The link between t depolarization and SR Ca release. *Biophys. J.* 47: 195a.
31. Cooper, K.E., J.M. Tang, J.L. Rae and R.S. Eisenberg. (1985) Cation selective channel in the epithelium of frog lens. *Biophys. J.* 86: 9a.
32. Cooper, K.E., J.M. Tang, J.L. Rae and R.S. Eisenberg. (1985) Cation-selective channel in the epithelium of frog lens. *J. Gen. Physiol.* 86: 9a-10a.
33. Cooper, K.E., J.M. Tang, J.L. Rae and R.S. Eisenberg. (1986) A cation-selective channel from frog lens epithelium. *Biophys. J.* 49: 6a.
34. Cooper, K.E., Gates, P.Y., and R.S. Eisenberg. (1987) Rate constants for ionic diffusion over barriers. *Biophys. J.* 51: 48a.
35. Gates, P.Y., Cooper, K.E., and R.S. Eisenberg. (1987) Diffusive flux through ionic channels. *Biophys. J.* 51: 48a.
36. Tang, J. M., Wang, J., and R.S. Eisenberg. (1987) Patch clamp of sarcoplasmic reticulum within muscle fibers. *Biophys. J.* 51: 106a.
37. Eisenberg, R.S., Hainsworth, A.H., and R.A. Levis. (1987). Open-channel noise in a cation channel of the frog lens epithelium. *J. Physiol. (London)* 396: 84P.
38. Hainsworth, A., Tang, J.M., Wang, J., Levis, R.A., and R.S. Eisenberg. (1988) Open channel noise in the K<sup>+</sup> channel of the sarcoplasmic reticulum. *Biophys. J.* 53: 151a.
39. Cooper, K.E., Gates, P.Y., and R.S. Eisenberg. (1988) Diffusion theory and discrete rate constants in ion permeation. *Biophys. J.* 55: 152a.
40. Moghaddamjoo, A., Levis, R.A., and R.S. Eisenberg. (1988). Automatic detection of channel currents. *Biophys. J.* 55: 153a.
41. R.S. Eisenberg. Channels as Enzymes (*title only*). (1988) *Medical Physics* 15: No. 4, p. 440.
42. J. Wang, J.M. Tang, and R.S. Eisenberg. (1989) Ca<sup>++</sup> channels in the sarcoplasmic reticulum (SR) of skinned lobster muscle fibers: patch clamp measurements. *J. Cell Biology* 107:144a.
43. R.S. Eisenberg, A.H. Hainsworth, and R.A. Levis. Open-channel noise in the potassium channel of lobster sarcoplasmic reticulum. (1988) *J. Physiol. (Cambridge Meeting)*, July: 107P).
44. J. Wang, J.M. Tang, and R.S. Eisenberg. Ca<sup>++</sup> channels from sarcoplasmic reticulum of split lobster muscle fibers. (1989) *Biophysical J.* 55: 207a.



45. A. Hainsworth, R.A. Levis, and R.S. Eisenberg. (1989) Excess open-channel noise in the SR  $K^+$  channel. *Biophysical J.* 55: 200a.
46. R.S. Eisenberg, A.H. Hainsworth, R.A. Levis. (1989) The effect of temperature on open-channel noise in the potassium channel of the lobster sarcoplasmic reticulum. *J. Physiol.* 410: 18P.
47. J.M. Tang, J. Wang, F.N. Quandt, and Eisenberg, R.S. (1990) Perfusing patch pipettes quietly and easily. *Biophys. J.* 57: 171a.
48. J.M. Tang, J. Wang, T. Lea and Eisenberg, R.S. (1990) Contractures and reloading in skinned lobster muscle fibers. *Biophys. J.* 57: 171a.
49. R.S. Eisenberg, J.M. Tang, and J. Wang. (1991) Ionic channels of the sarcoplasmic reticulum of lobster remotor muscle. *Biophys. J.* 59: 177a.
50. D.P. Chen and R.S. Eisenberg. (1991) Constant fields and constant gradients in open ionic channels. *Biophys. J.* 59: 404a.
51. R.S. Eisenberg, D.P. Chen, and V. Barcilon. (1991) Constant fields and constant gradients in open ionic channels. *Physiologist.* 34: 102.
52. Wang, J., Tang, J.M., and RS Eisenberg. (1992) Calcium conducting channel in SR: calcium pump without occlusion? *Biophys. J.* 61. A433.
53. Chen, DP, Barcilon, V. and RS Eisenberg. (1992) Induced and permanent charge in open ionic channels. *Biophys. J.* 61. A11.
54. Chen, DP, and R Eisenberg. (1992) Exchange diffusion, single filing, and gating in macroscopic channels of one conformation. *J. Gen. Physiol.* 100: 9a. [\[PDF\]](#)
55. Eisenberg, Robert From Structure to Permeation in Open Ionic Channels. (1993) *Biophys. J.* 64:A22. [\[PDF\]](#)
56. Eisenberg, Robert and Duanpin Chen. (1993) Poisson-Nernst-Planck (**PNP**) theory of an open ionic channel. *Biophys. J.* 64:A22. [\[PDF\]](#)
57. Chen, Duanpin and Robert Eisenberg. (1993) Poisson-Nernst-Planck (**PNP**) theory of open ionic channels. *Biophys. J.* 64:A22. [\[PDF\]](#)
58. Chen, Duan P. and Robert S. Eisenberg. (1994) Divalent effects on mono-valent cation channels, an extension of Poisson-Nernst-Planck theory. *Biophys. J.* 66(2) A292.
59. Elber, Ron, Duan Chen, Danuta Rojewska, and Bob Eisenberg. (1994)  $Na^+$  in Gramicidin: the prototype permion. *Biophys. J.* 66(2) A354.
60. Eisenberg, Bob, Malgorzata Klósek, and Zeev Schuss. (1994) Stochastic theory of the open channel. *Biophys. J.* 66(2) A354.
61. Chen, Duan, Paul Kienker, Jim Lear and Bob Eisenberg. (1995) PNP Theory fits current-voltage (*IV*) relations of a synthetic channel in 7 solutions. *Biophys. J.* 68:A370.
62. Chen, Duan, Wolfgang Nonner, and Bob Eisenberg. PNP (1995) Theory fits current-voltage (*IV*) relations of a neuronal anion channel in 13 solutions. *Biophys. J.* 68:A370

63. Chen, D., Eisenberg, R., Jerome, J., and Shu, C. (1995) PH (Poisson-Hydrodynamic) Theory of an open channel. *Biophys. J.*, 68:A371.
64. Tang, John, Rick Levis, Kelvin Lynn, and Bob Eisenberg. (1995) Opening and closing transitions of a large mitochondrial channel with microsecond time resolution. *Biophys. J.*, 68:A145, 1995. [[PDF<sub>1</sub>](#)] [[PDF<sub>2</sub>](#)]
65. Janovic, Slobidan, Kelvin Lynn, Xiaoye Wu, Bob Eisenberg, and Rick Levis. (1995) Real-time analysis of single channel currents. *Biophys. J.*, 68:A42.
66. Eisenberg, Robert S., Chen, P. Solutions to Fields in Biological Channels. (1996) American Chemical Society, Division of Physical Chemistry, 212<sup>th</sup> Meeting. *Printed but perhaps not published Abstract.*
67. Chen, D., Xu, L., Tripathy, A., Meissner, G., and R. Eisenberg (1997) Permeation through the calcium release channel (CRC) of cardiac muscle. *Biophys. J.*, 72:A108.
68. Tang, J., Chen, D., Saint, N., Rosenbusch, J., and R. Eisenberg (1997). Permeation through porin and its mutant G119D. *Biophys. J.*, 72:A108, 1997.
69. Tang, J., Saint, N., Rosenbusch, J., and R. Eisenberg (1997). Currents through single channels of maltoporin. *Biophys. J.*, 72:A108, 1997.
70. Gardner, Carl, Eisenberg, B., and Joe Jerome. (1998) Numerical simulation of rectangular channel currents. *Biophys. J.*, 74 A342.
71. Schuss, Zeev and Eisenberg, B. (1998) Stochastic and continuum models of unidirectional fluxes in open ionic channels. *Biophys. J.*, 74 A342.
72. Elber, R. and Eisenberg, B. (1998) Molecular dynamics simulations of solvated ions between a membrane and metal electrodes at various electric potentials. *Biophys. J.*, 74 A342.
73. Chen, D., Tripathy, A., Xu, L., Meissner, G. and Bob Eisenberg. (1998) Permeation in the calcium release channel (CRC) of skeletal muscle. *Biophys. J.*, 74 A342.
74. Chen, D., Tripathy, A., Xu, L., Meissner, G. and Bob Eisenberg. (1998) Selectivity of calcium release channel (CRC) of cardiac muscle. *Biophys. J.*, 74 A342.
75. Nonner, W., Chen, D. and Bob Eisenberg. (1998) Anomalous mole fraction effects: an electrostatic interpretation. *Biophys. J.*, 74 A342.
76. Nonner, W. and Bob Eisenberg. (1998) Calcium channel permeability and glutamate residues linked by PNP Theory. *Biophys. J.*, 74 A342.
77. Catacuzzeno, L., W. Nonner, and B. Eisenberg. (1999) PNP2 Links Crystallographic Structure and Conduction in K Channels. *Biophysical Journal*. 76:A79.
78. Gillespie, D, and Bob Eisenberg. (1999) An analytic formula for the reversal potential derived from *PNP* theory. . *Biophysical Journal*. 76:A192.
79. Hollerbach, U., Chen, D., Nonner, W., and Bob Eisenberg. (1999) Three-dimensional Poisson-Nernst-Planck Theory of Open Channels. *Biophysical J.* 76:A205.
80. Catacuzzeno, L., W. Nonner, L. Blum, and B. Eisenberg. Ca Selectivity in the 'EEEE' Locus of L-type Ca Channels. (1999) *Biophysical Journal*. 76:A259.

81. Nonner, W, L. Catacuzzeno, and B. Eisenberg. (2000) Ionic selectivity in K channels. *Biophysical Journal*. 78:A96.
82. Nonner, W, L. Catacuzzeno, and B. Eisenberg. (2000) Ionic selectivity in calcium channels. *Biophysical Journal*. 78:A455.
83. Chen, Duan, Le Xu, Bob Eisenberg, and Gerhard Meissner. (2000) Calcium and potassium ion selectivity of skeletal muscle ryanodine receptor. *Biophysical Journal*. 78:A462.
84. van der Straaten, T.A., RS Eisenberg, JM Tang, U Ravaioli, and N Aluru. (2001) Three dimensional Poisson Nernst Planck Simulation of ompF porin. *Biophysical Journal*. 80: 115a.
85. Chen, Duan, L Xu, B Eisenberg, and G Meissner. (2001) Ca ion permeation through the calcium release channel (ryanodine receptor) of cardiac muscle *Biophysical Journal*. 50: 115a.
84. Nonner, W., B Eisenberg, and D Henderson (2001) Ca channel selectivity: the role of solvent *Biophysical Journal*. 80:453a.
85. Nonner, W., Gillespie, D., and B Eisenberg. (2002) Flux and selectivity in the Ca channel: a density functional approach. *Biophysical Journal*. 82: 340a.
86. Gillespie, D. and RS Eisenberg. (2002) Measurements of selectivity: physical interpretation. *Biophysical Journal*. 82:206a.
87. Van der Straaten, T.A., Tang, J.M., Eisenberg, RS, Ravaioli, U., Aluru, N., Varma, S., and E. Jakobsson. (2002) A study of mutations of ompf porin using Poisson-Nernst-Planck theory. *Biophys. J.* 82: 207a. [[PDF](#)]
88. Chiu, See-Wing, Varma, S., Jakobsson, E., Tang, J.M., van der Straaten, T., Eisenberg, and R.S. (2002) Molecular dynamics of permeation in porin and its mutant G119D. *Biophysical Journal*. 82:208a.
89. Gillespie, D., Nonner, W., and Bob Eisenberg. (2002) Physical model of selectivity and flux in Na channels. *Biophysical Journal* 84 (Number 2) p. 67a.
90. Nonner, Wolfgang, Gillespie, Dirk, Eisenberg, Bob, and Douglas Henderson. (2002) A physical basis for large-ion selectivity. *Biophysical Journal* 84 (Number 2) 93a.
91. Chen, Duan, Kuang, Zhifeng, Boda, Deszo, Eisenberg, Bob, Busath, David and Douglas Henderson. (2003) Ion channel permeation simulated by non-equilibrium molecular dynamics calibrated by equilibrium Monte Carlo. *Biophysical Journal* 84 (Number 2) 94a.
92. Boda, Dezso, Gillespie, Dirk, Nonner, Wolfgang, Henderson, Douglas, Busath, David, and Bob Eisenberg. (2004) Effects of dielectrics on selectivity: computing induced charge in Monte Carlo simulations. *Biophysical Journal* 86 6a.
93. Miedema, Henk, Meter-Arkema, Anita, Wierenga, Jenny, Hektor, Hans, Tang, John, Eisenberg, Bob, and Wim Meijberg. (2004) Permeation properties of an engineered OmpF containing the EEEE locus of Ca-channels. *Biophysical Journal* 86 260a.

94. Nonner, Wolfgang, Gillespie, Dirk, and Bob Eisenberg. (2004) Moving gating charges: comparing electrostatic energetics of the S4 motion of different models. *Biophysical Journal* 86 436a.
95. Aguilera-Arzo, Marcel, Garcia-Celma, Juan, Aguilera, Vicente, and Robert Eisenberg. (2004) Computing numerically access resistance of a channel. *Biophysical Journal* 86 629a.
96. Peyser, Alexander, Nonner, Wolfgang R., Gillespie, Dirk, and Eisenberg Bob. (2005) Electrostrictive Forces in S4 Models. *Biophysical Journal* 88 458a.
97. Henderson, D., Boda, D., Valisko, M., Gillespie, D, Eisenberg, B., and Nonner, W. (2005) New constant voltage method of simulating ions in a dielectric near a metallic electrode *PacificChem 2005*, Honolulu HI.
98. Eisenberg, R. S. (2005) Ions in channels: Life's transistors *PacificChem 2005*, Honolulu HI.
99. Wilk, S.J., Petrossian, L., Goryll, M., Thornton, T.J., Goodnick, S.M., Tang, J.M., and Eisenberg, R.S. (2005) Integrated Platform for Ion Channel Sensing. *IEEE SENSORS 2005: the 4th IEEE conference on sensors*.
100. Siwy, Z, Powell, M., Kalman, E., Heins, E., Martin, C.R., and Eisenberg, R.S. (2006). Pores in plastic can be calcium sensitive and gate. *Biophysical Journal* 90 314a.
101. Boda, Dezso, Valisko, Monika, Gillespie, Dirk, Nonner, Wolfgang, Henderson, Douglas and Eisenberg, Bob. (2006) Dielectrics Enhance the Selectivity of Calcium Channels. *Biophysical Journal* 90 404a.
102. Nonner, Wolfgang, Gillespie, Dirk, and Eisenberg, Bob. (2006) How Do Long Pores Make Better K Channels? *Biophysical Journal* 90 239a.
103. Eisenberg, Bob. (2007) . How can a channel tell  $\text{Ca}^{2+}$  from  $\text{Na}^+$  ? *Biophysical Journal* 92 342a; Symposium 14: Modeling as a Tool in Biophysics.
104. Siwy, Zuzanna S., Powell, Matthew R., Kalman, Eric, and Eisenberg Robert S. (2007) Gating, Modulation, and Rectification in a Large Diameter Abiotic Nanopore. *Biophysical Journal* 92 342a Symposium 14: Modeling as a Tool in Biophysics.
105. Boda, Dezso, Valisko, Monika, Eisenberg, Bob, Nonner, Wolfgang, Henderson, Douglas, and Gillespie, Dirk. (2007) The effect of the protein dielectric coefficient and pore radius on the Na affinity of a model sodium channel. *Biophysical Journal* 92 p. 609a. Poster Board [[PDF](#)]
106. Powell, Matthew R., Sullivan, Michael, Siwy, Zuzanna S., and Eisenberg. Robert S. (2007) Stochastic Sensing of Analytes by a Synthetic Nanopore with Adaptor. *Biophysical Journal* 92 p. 649a.
107. Arning, Kattrin, Burger, Martin, Engl, Heinz, Eisenberg, Robert, He, Lin, and Marie Wolfram. (2007) Simulation of ion transport through nanopores. *International Conference on Simulation of Semiconductor Processes and Devices (SISPAD)*.
108. Powell, Matthew R., Sullivan, Michael, Vlassiok, Ivan, Constantin, Dragos, Sudre, Olivier, Martens, Craig, Eisenberg, Robert S., and Siwy, Zuzanna. (2008) Ion Current Oscillations Caused by Femtoliter Volume Precipitation in a Nanopore. *Biophysical Journal* 94 p. 333a. Poster Board [[PDF](#)]

109. Boda, Dezső, Nonner, Wolfgang, Valisko, Monika, Henderson, Douglas, Eisenberg, Bob, and Gillespie, Dirk. (2008) Competition of Steric repulsion and Electrostatic Attraction in the Selectivity Filter of Model Calcium Channels. *Biophysical Journal* 94 p. 447a. Poster Board [[PDF](#)]
110. Eisenberg, Bob, Roth, Roland, Gillespie, Dirk, and Nonner, Wolfgang. (2008) Bubbles, Gating, and Anesthetics in Ion Channels. *Biophysical Journal* 94 p. 1040a. Abstract [[PDF](#)]
111. Eisenberg, Bob, Boda, Dezső, Giri, Janhavi, Fonseca, James, Gillespie, Dirk, Henderson, Doug, and Nonner, Wolfgang. (2009) Self-organized Models of Selectivity in Ca and Na Channels. *Biophysical Journal*, Volume 96, Issue 3, 253a. Abstract [[PDF](#)] and Poster Board [[PDF](#)] Other versions available at Institute of Mathematics and its Applications IMA, University of Minnesota, [Self-Organized IMA link](#) and on the <https://arxiv.org> with Paper ID [arXiv:0906.5173](#)
112. Knepley, Matthew G., Karpeev, Dmitry A., Eisenberg, Robert S., and Gillespie, Dirk. (2009) Energetics of Calcium Selectivity: A Three-Dimensional Classical Density Functional Theory Approach. *Biophysical Journal*, Volume 96, Issue 3, 661a. Abstract [[PDF](#)] and Poster Board 461 [[PDF](#)]
113. Mori, Yoichiro, Liu, Chun, and RS Eisenberg. (2010) A multidomain model for electrodiffusion and water flow Volume 98 pp. 96a Abstract [[PDF](#)] and Poster Board 511 [[PDF](#)]
114. Fonseca, James E. Boda, Dezső, Nonner, Wolfgang, and Bob Eisenberg. (2010) Conductance and concentration relationship in a reduced model of the K<sup>+</sup> channel. Volume 98 pp. 117a Abstract [[PDF](#)] and Poster Board 613 [[PDF](#)]
115. Zhang, Chao, Raugei, Simone, Eisenberg, Bob, and Paolo Carloni. (2010) On the domain of applicability of currently used force fields for the calculation of the activity of alkali ions at physiological ionic strength. *Biophysical Journal*. Volume 98 pp. 330a - 331a. Abstract [[PDF](#)] and Poster Board 1718 [[PDF](#)]
116. Giri, Janhavi, Eisenberg, Bob, Gillespie, Henderson, Douglas, and Dezső Boda. (2010) Monte Carlo simulation of free energy components. Energetics of selective binding in a reduced model of L-type Ca<sup>2+</sup> channels. *Biophysical Journal*. Volume 98 pp. 514a – 515a Abstract [[PDF](#)] and Poster Board 2665 [[PDF](#)]
117. Eisenberg, Robert S., Hyon, YunKyong, and Chun Liu. (2010) Energetic Variational Analysis *EnVarA* of ions in calcium and sodium channels. *Biophysical Journal*. Volume 98 pp. 515a. Abstract [[PDF](#)] and Poster Board 2666 [[PDF](#)]
118. Mori, Y., C. Liu, and R.S. Eisenberg. (2011) Electrodiffusion and Osmotic Water Flow and its Variational Structure. *Biophysical Journal*. 100 (3): p. 86a-87a. Abstract 466-Pos [[PDF](#)] and Poster Board B266 [[PDF](#)]
119. Berti, C., D. Gillespie, B. Eisenberg, S. Furini, and C. Fiegna. (2011) A novel Brownian-Dynamics Algorithm for the Simulation of Ion Conduction Through Membrane Pores. *Biophysical Journal*. 100 (3): p. 158a. Abstract 867-Pos [[PDF](#)] and Poster Board B667 [[PDF](#)]

120. Ryham, R., R. Eisenberg, C. Liu, and F. Cohen. (2011) A Continuum Variational Approach to Vesicle Membrane Modeling. *Biophysical Journal*. Volume 100 (3): p. 187a. Abstract [\[PDF\]](#) and Platform 1025 [\[PDF\]](#)
121. Jimenez-Morales, D., J. Liang, and B. Eisenberg. (2011) Active Sites of Enzymes are Crowded with Charge. *Biophysical Journal*. 100 (3): p. 218a. Abstract 1191-Pos [\[PDF\]](#) and Poster Board B101 [\[PDF\]](#)
122. Hyon, Y., J.E. Fonseca, B. Eisenberg, and C. Liu. (2011) A new Poisson-Nernst-Planck Equation (PNP-FS-IF) for charge inversion near walls. *Biophysical Journal*. 100 (3): p. 578a. Abstract 3130-Pos [\[PDF\]](#) and Poster Board B235 [\[PDF\]](#)
123. Giri, J., J.M. Tang, C. Wirth, C.M. Peneff, T. Schirmer, and B. Eisenberg. (2011) Single Channel Measurements of N-Acetylneuraminic Acid-Inducible Channel (NANC) in *E. coli*. *Biophysical Journal*. Volume 100 (3): p. 579a. Abstract 3136-Pos [\[PDF\]](#) and Poster Board B241 [\[PDF\]](#)
124. Giri, J., J.M. Tang, C. Wirth, C.M. Peneff, T. Schirmer, and B. Eisenberg. (2011) Sialic Acid Transport in *E. coli*: Role of Outer Membrane Porin NanC. *Biophysical Journal*. 100 (3): p. 577a. Abstract 3123-Pos [\[PDF\]](#) and Poster Board B228 [\[PDF\]](#)
125. Jimenez-Morales, D., J. Liang, and B. Eisenberg. (2011) Active Sites of Enzymes are Crowded with Charge. 6<sup>th</sup> Annual Midwest Conference on Protein Folding, Assembly, and Molecular Motions. University of Notre Dame. (*not published*) [\[PDF\]](#)
126. Ryham, Rolf, Fredric S. Cohen, Robert Eisenberg, Chun Liu. (2012) A dynamic model of fusion pores in lipid bilayers *Biophysical Journal*. 102 (3) pp. 500a - 501a. Abstract 2551-Pos [\[PDF\]](#) and Poster Board B321 [\[PDF\]](#)
127. Berti, Claudio, Simone Furini, Dirk Gillespie, Dezső Boda, Bob Eisenberg, Claudio Fiegna. (2012) Brownian Dynamics Simulation of Calcium Channels. *Biophysical Journal* 102 (3) pp. 173a. Abstract 861-Pos [\[PDF\]](#) and Poster Board B647 [\[PDF\]](#)
128. Eisenberg, Bob. (2012) Rate Constants are Variables in Almost all Chemical Reactions. *Biophysical Journal* 102 (3) pp. 447a - 448a. Abstract 1370-Pos [\[PDF\]](#) and Poster Board B140 [\[PDF\]](#)
129. Ryham, R. J., M. A. Ward, R. S. Eisenberg, and F. S. Cohen. (2013) Calculating Minimal Energy Shapes of Fusion Pores. *Biophysical Journal* 104:91a-92a. Abstract 479-Pos [\[PDF\]](#) and Poster Board B248 [\[PDF\]](#)
130. Berti, C., D. Gillespie, D. Boda, B. Eisenberg, and C. Fiegna. (2013) Brownian Dynamics Study of Current and Selectivity of Calcium Channels. *Biophysical Journal* 104:102a-103a. Abstract 533-Pos [\[PDF\]](#) Poster Board B302 [\[PDF\]](#)
131. Eisenberg, R. S., I. Kaufman, D. Luchinsky, R. Tindjong, and P. V. E. McClintock. (2013) Discrete Conductance Levels in Calcium Channel Models: Multiband Calcium Selective Conduction. *Biophysical Journal* 104:358a. [\[PDF\]](#) Platform 1836 [\[PDF\]](#)
132. Eisenberg, B., T.-L. Horng, T.-C. Lin, and C. Liu. (2013) Steric PNP (Poisson-Nernst-Planck): Ions in Channels. *Biophysical Journal* 104:509a. Abstract 2605 [\[PDF\]](#); Poster Board B624 [\[PDF\]](#)

133. Luchinsky, Dmitry G., Tindjong, Rodrigue, Kaufman, Igor, McClintock, Peter V. E., Khovanov Igor A., Eisenberg, Bob. (2014) Observation Of “Remote Knock-On”, A New Permeation-Enhancement Mechanism In Ion Channels. *Biophysical Journal* 106:133a; Abstract 684 [[PDF](#)]; Poster Board B439 [[PDF](#)]
134. Eisenberg, B. and Liu, Jinn-Liang. (2014) Poisson-Fermi Model of a Calcium Channel: correlations and dielectric coefficient are computed outputs, *Biophysical Journal* 106:133a-134a; Abstract 686 [[PDF](#)]; Poster Board B441 [[PDF](#)]
135. Eisenberg, B. (2015) Rate constant models cannot describe movement of charged atoms or molecules. *Biophysical Journal* 108:577a; Abstract 2920 [[PDF](#)]; Poster Board B350 [[PDF](#)]
136. Kaufman, Igor, Gibby, William, Dmitri G. Luchinsky, Dmitri, McClintock, Peter V.E. and Robert S. Eisenberg. (2015) Coulomb blockade model of permeation in biological ion channels *Biophysical Late Abstract* L3552, [[PDF](#)]; Poster Board LB34 [[PDF](#)] *N.B. Late abstracts are not published.*
137. Eisenberg, R. and J.L. Liu (2015) Poisson Fermi model of the ion exchange mechanism of the sodium/calcium exchanger NCX. *Neurosciences Meeting October 2015* Presentation Number: 450.09 [[PDF of Abstract](#)] Poster Board Number: DD28 [[PDF of Poster](#)]
138. Horng, Tzyy-Leng, Eisenberg, Robert S., Liu, Chun, Bezanilla, Francisco. (2016). Gating current models computed with consistent interactions. *Biophysical Journal* 110: 102a-103a [[PDF of Abstract](#)] Poster 528; Poster Board B308 [[PDF of Poster](#)]
139. Liu, Jinn-Liang, Eisenberg, Bob. (2016). Binding sites of the Ca/Na Exchanger NCX analyzed with Poisson Fermi theory. *Biophysical Journal* 110: 260a [[PDF of Abstract](#)] Poster 1293; Pos Board B270 [[PDF of Poster](#)]
140. Gibby, William A.T., Luchinsky, Dmitri G., Kaufman, Igor Kh, McClintock, Peter V.E., Stefanovska, Aneta Eisenberg, Robert S (2016). Insights into Ion Channel Selectivity with Ionic Coulomb Blockade *Biophysical Journal*, 110: p343a 1693-Plat [[PDF of Abstract](#)]
141. Luchinsky, Dmitri G., Gibby, Will, Kaufman, Igor Kh, , Dmitri, Eisenberg, Robert S., McClintock, Peter V.E. (2016) On the conductivity and selectivity paradox *Biophysical Late Abstract* L3306, [[PDF](#)]; Poster Board LB66 *N.B. Late abstracts are not published.*
142. Eisenberg, Bob. Voltage Sensor of Sodium Channels: Natural Nanotechnology. (2019) *Book of Abstracts 20th International Workshop on Computational Nanotechnology - IWCN* May 20-24, 2019 p. 81. [ISBN 978-3-9504738-0-3 Presentations 81](#) [[PDF](#)]
143. Nicholson, Stanley, Minh, David, Eisenberg, Bob. (2022) Atomic Interactions as Linear Systems: Hydrogen Bonds in the Alpha Helix of Crambin. Poster award, College of Computing, Illinois Institute of Technology. [[PDF](#)]

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