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COMPUTATIONAL BIOPHYSICS OF PROTEINS AND MEMBRANES

EDUCATION

PhD Physics, University of Southern California	2013
MS Computer Science, University of Southern California	2012
MA Physics, University of Southern California	2008
BS Physics, San Francisco State University	2006

EXPERIENCE

Postdoctoral Researcher, University of California Santa Barbara	2013–Present
Graduate Research Assistant, USC/Information Sciences Institute (ISI)	2008–2013
Graduate Research Assistant, USC/MOSIS	2011–2013
Graduate Teaching Assistant (Physics), USC	2006–2008
Undergraduate Research Assistant, SFSU	2003–2006

ACHIEVEMENTS AND AWARDS

Dow Materials institute and Materials Research Laboratory Travel Fellowship	2015, 2016
XSEDE/NSF Supercomputing Startup Allocation (TG-MCB140122: Interactions of Amyloid Proteins with Cellular Membranes in Electric Fields)	2014
Biophysical Society Education Travel Award	2014
Don Eden Award	2005
College of Science & Engineering Student Advisory Board	2005
Golden Key Honor Society	2004

PEER REVIEWED PUBLICATIONS (21)

1. **Levine ZA**, Shea JE. 2017. Simulations of Disordered Proteins and Systems with Conformational Heterogeneity. *Current Opinion in Structural Biology*. 43, 95-103. DOI: 10.1016/j.sbi.2016.11.006
2. Das S, Lee BH, Linstadt RTH, Cunha K, Li Y, **Levine ZA**, Lipshutz BH, Lins RD, Shea JE, Israelachvili JN, Heeger AJ, and Ahn BK. 2016. Molecularly Smooth Self-Assembled Monolayer for High-Mobility Organic Field-Effect Transistors. *Nano Letters*. 16 (10), 6709–6715. DOI: 10.1021/acs.nanolett.6b03860
3. **Levine ZA**, Rapp MV, Wei W, Mullen RG, Wu C, Zerze GH, Mittal J, Israelachvili JN, Waite JH, Shea JE. 2016. Surface Force Measurements and Simulations of Mussel-Derived Peptide Adhesives on Wet Organic Surfaces. *Proceedings of the National Academy of Sciences of the United States of America*. 113 (16), 4332-4337. DOI: 10.1073/pnas.1603065113
4. **Levine ZA**, DeNardis NI, Vernier PT. 2016. Molecular Dynamics Interactions of Phospholipids and Hydrocarbons Between Silicon Electrodes. *Langmuir*. 32 (11), 2808-2819. DOI: 10.1021/acs.langmuir.5b04090
5. Vernier PT, **Levine ZA**. 2016. Biological Responses. *Bioelectrics*. Edited by Akiyama H and Heller R. ISBN: 978-4-431-56095-1. Springer. DOI: 10.1007/978-4-431-56095-1.

6. **Levine ZA**, Larini L, LaPointe NE, Feinstein SC, Shea JE. 2015. Regulation and Aggregation of Intrinsically Disordered Peptides. *Proceedings of the National Academy of Sciences of the United States of America*. 112 (9), 2758-2763. DOI: 10.1073/pnas.1418155112 [**8,818 downloads as of Dec. 2016**]
7. Zerze GH, Mullen RG, **Levine ZA**, Shea JE, Mittal J. 2015. To what extent does surface hydrophobicity dictate peptide folding and stability near surfaces? *Langmuir*. 31 (44), 12223-12230. DOI: 10.1021/acs.langmuir.5b03814 (**GHZ, RGM, and ZAL share first-authorship**)
8. **Levine ZA**, Fischer SA, Shea JE, and Pfaendtner J. 2015. Trp-Cage Folding on Organic Surfaces. *The Journal of Physical Chemistry B*. 119 (33), 10417-10425. DOI: 10.1021/acs.jpcc.5b04213
9. Shea JE, **Levine ZA**. 2015. Studying The Early Stages Of Protein Aggregation Using Replica Exchange Molecular Dynamics Simulations. *Protein Amyloid Aggregation: Methods and Protocols (Methods in Molecular Biology)*. Edited by David Eliezer. ISBN: 978-1493929771. Humana Press
10. Vernier PT, **Levine ZA**, Ho MC, Xiao S, Semenov I, Pakhomov A. 2015. Picosecond and Terahertz Perturbation of Interfacial Water and Electroporation of Biological Membranes. *Journal of Membrane Biology*. 1-11. DOI: 10.1007/s00232-015-9788-7
11. Kohler S, **Levine ZA**, García-Fernández MA, Ho MC, Vernier PT, Leveque P, Arnaud-Cormos D. 2015. Electrical analysis of cell membrane poration by an intense nanosecond pulsed electric field, using an atomistic-to-continuum method. *Transactions on Microwave Theory and Techniques (IEEE)*, 63 (6), 2032,2040 DOI: 10.1109/TMTT.2015.2418764
12. **Levine ZA**, Venable RM, Watson MC, Lerner MG, Shea JE, Pastor RW, Brown FLH. 2014. Determination of Biomembrane Bending Moduli in Fully Atomistic Simulations. *Journal of the American Chemical Society*, 136 (39), 13582-13585. DOI: 10.1021/Ja507910r
13. Ho MC, Casciola M, **Levine ZA**, Vernier PT. 2013. Molecular Dynamics Simulations of Ion Conductance in Field-Stabilized Nanoscale Lipid Electropores. *Journal of Physical Chemistry B*, 117 (39), 11633-11640. DOI: 10.1021/jp401722g
14. Romeo S, Wu YH, **Levine ZA**, Gundersen MA, Vernier PT. 2013. Water influx and cell swelling after nanosecond electroporation. *Biochim. Biophys. Acta*, 1828(8), 1715-1722. DOI: 10.1016/j.bbame.2013.03.007
15. Ho MC, **Levine ZA**, Vernier PT. 2013. Nanoscale, Electric Field-Driven Water Bridges in Vacuum Gaps and Lipid Bilayers. *Journal of Membrane Biology*, 246(11), 793-801. DOI: 10.1007/s00232-013-9549-4
16. Tokman M, Lee JH, **Levine ZA**, Ho MC, Colvin ME, Vernier PT. 2013. Electric Field-Driven Water Dipoles: Nanoscale Architecture of Electroporation. *PLoS ONE*, 8:e61111. DOI: 10.1371/journal.pone.0061111
17. Vernier PT, **Levine ZA**, Gundersen MA. 2012. Water Bridges in Electroporation of Phospholipid Bilayers. *Proc. of the IEEE*. 101, 494-504. DOI: 10.1109/JPROC.2012.2222011
18. **Levine ZA**, Vernier PT. 2012. Calcium and Phosphatidylserine Inhibit Lipid Electropore Formation and Reduce Pore Lifetime. *Journal of Membrane Biology*. 245, 599-610. DOI: 10.1007/s00232-012-9471-1
19. Knecht V, **Levine ZA**, Vernier PT. 2010. Electrophoresis of neutral oil in water. *Journal of Colloid and Interface Science*. 352(2), 223-231. DOI: 10.1016/j.jcis.2010.07.002 [**Cover Article**]
20. **Levine ZA**, Vernier PT. 2010. Life Cycle of an Electropore: Field-Dependent and Field-Independent Steps in Pore Creation and Annihilation. *Journal of Membrane Biology*. 236(1), 27-36. DOI: 10.1007/s00232-010-9277-y

21. Vernier PT, **Levine ZA**, Wu YH, Joubert V, Ziegler MJ, Mir LM, Tieleman DP. 2009. Electroporating Fields Target Oxidatively Damaged Areas in the Cell Membrane. PLoS ONE, 4(11), e7966. DOI: 10.1371/journal.pone.0007966

MANUSCRIPTS UNDER REVIEW (2)

22. Sungbaek S, Lee DW, Ahn J, Cunha K, Filippidi E, Ju SW, Shin E, Kim BS, **Levine ZA**, Lins R, Israelachvili J, Waite JH, Valentine M, Shea JE, Ahn BK. 2017. Significant performance enhancement of polymer resins by bioinspired dynamic bonding. Nature Communications (NCOMMS-17-00447-T).
23. Sözer EB, **Levine ZA**, Vernier PT. 2017. Quantitative Limits on Nanoscale Transport via the Electropore — Measuring and Modeling Minimal Perturbations. Scientific Reports (SREP-16-34033-T).

MANUSCRIPTS IN PROGRESS (5)

24. **Levine ZA**, Okada A, Taranishi K, Langen R, Cohen P, Shea JE. Reducing IAPP Aggregation with Mitochondrial Humanin Peptides; Results from Simulations and Experiments.
25. **Levine ZA**, Shea JE. Optimization of Mussel-Inspired Bioadhesives on Silicon Dioxide Surfaces.
26. **Levine ZA**, Cunha K, Shea JE. Folding and Adhesion of Mussel-Inspired Peptides on Inorganic Underwater Surfaces.
27. **Levine ZA**. Denaturing Human Aquaporin under Membrane-Permeabilizing Electric Fields.
28. Gowrishankar TR, **Levine ZA**, Vernier PT, Weaver JC. Numerical Models of Aqueous Electropore Expansion Rates.

CONFERENCE PROCEEDINGS

1. Kohler S., Ho M, **Levine ZA**, Vernier PT, Leveque P, Arnaud-Cormos D, Electrical analysis of cell membrane poration induced by an intense nanosecond pulsed electric field, using an atomistic-to-continuum method. IEEE Microwave Symposium 2014.

OUTREACH AND VOLUNTEERING

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|---|------|
| 1. Biophysics instructor at the Telluride School on Theoretical Chemistry | 2015 |
| 2. Science instructor for UCSB CNSI Family Ultimate Science Exploration | 2015 |
| 3. Outreach volunteer for the MRL Science Teacher Workshop | 2014 |
| 4. Education outreach volunteer for the UCSB MRL: Ellwood elementary school | 2014 |
| 5. Outreach scientist and speaker for the Santa Barbara Museum of Natural History | 2014 |

SERVICE TO PROFESSION

1. Reviewer – Journal of Membrane Biology
2. Reviewer – Journal of Colloids and Interface Science
3. Reviewer – Journal of Physical Chemistry (B/Letters)
4. Reviewer – Bioelectromagnetics Journal
5. Reviewer – Molecular BioSystems
6. Mentor to 2 graduate students and 1 undergraduate student.

INVITED PRESENTATIONS:

1. **Levine ZA**, Okada A, Teranishi K, Langen R, Shea JE. 2016. Reducing IAPP Aggregation with Mitochondrial Humanin Peptides; Results from Simulations and Experiments. Biophysical Society Annual Meeting. Los Angeles, CA, USA.

2. **Levine ZA**, Mullen RG, Shea JE. 2015. Protein folding and assembly on membrane-mimics in constant volume replica-exchange simulations. Invited Speaker for the “Role of Membranes in Amyloid-formation and the Pathogenicity of Amyloid Diseases” platform. American Chemical Society National Meeting. Denver, CO, USA.
3. **Levine ZA**, Larini L, LaPointe N, Feinstein S, Shea JE. 2014. Tau(273-284): A Molecular Dynamics Study of Intrinsically Disordered Protein Conformations in the Presence Of Osmolytes. Biophysical Society Annual Meeting. San Francisco, CA, USA.
4. **Levine ZA**, DeNardis NI, Vernier PT. 2013. Molecular Dynamics Interactions of Phospholipids and Hydrocarbons Between Silicon Electrodes. Biophysical Society Annual Meeting. Philadelphia, PA, USA.
5. **Levine ZA**, Vernier PT. 2012. Electropore Dynamics in Time-Dependent Electric Fields. Biophysical Society Annual Meeting. San Diego, CA, USA.
6. **Levine ZA**, Vernier PT. 2011. Temperature Modulation of Phospholipid Bilayer Electropore Creation and Annihilation. Biophysical Society Annual Meeting. Baltimore, MD, USA.
7. **Levine ZA**, Ziegler MJ, Vernier PT. 2010. Life Cycle of an Electropore: A Molecular Dynamics Investigation of the Electroporation of Heterogeneous Lipid Bilayers (PC:PS) In the Presence of Calcium Ions. Biophysical Society Annual Meeting. San Francisco, CA, USA.
8. **Levine ZA**, Vernier PT. 2010. Electropore Life Cycles in Heterogeneous Phospholipid Bilayers in the Presence of Calcium. Bioelectromagnetics Society Annual Meeting. Seoul, Republic of Korea.
9. **Levine ZA**, Vernier PT. Gordon Conference on Bioelectrochemistry. 2010. Lipid Bilayer Electropore Modulation using Calcium, Phosphatidylserine, and Temperature. Biddeford, ME, USA.
10. **Levine ZA**, Wu YH, Ziegler MJ, Tieleman DP, Vernier PT. 2009. Electroporation Sensitivity of Oxidized Phospholipid Bilayers. Biophysical Society Annual Meeting. Boston, MA, USA.
11. **Levine ZA**, Vernier PT. 2009. Increased Susceptibility of Oxidized Phospholipid Bilayers to Electropermeabilization. University of California System-wide Bioengineering Symposium. University of California, Merced, USA.
12. **Levine ZA**, Vernier PT. 2009. Electropermeabilization of Mixed Lipid Bilayers (PC:PS) in the Presence of Calcium. Biomedical Engineering Society Annual Meeting. Pittsburgh, PA, USA.
13. **Levine ZA**, Vernier PT. 2009. Electropermeabilization of Mixed Lipid Bilayers (PC:PS) in the Presence of Calcium. Electroporation-based Technologies and Treatments Workshop. University of Ljubljana, Ljubljana, Slovenia.

CONTRIBUTED PRESENTATIONS

1. Tokman M, Lee JH, **Levine ZA**, Ho MC, Colvin ME, Vernier PT. 2014. Electric Field-Driven Water Dipoles: Nanoscale Architecture of Electroporation. Biophysical Society Annual Meeting. San Francisco, CA.
2. Vernier PT, Kohler S, Ho MC, **Levine ZA**, Leveque P, Arnaud-Cormos D. 2013. Toward the physical mechanisms of nanopulse-induced pore formation combining Molecular Dynamics and a 3D electromagnetic tool. Bioelectromagnetics Society Annual Meeting (BioEM). Thessaloniki, Greece.
3. Vernier PT, **Levine ZA**, and Wu YH. 2011. Nanoelectropores in cell membranes and simulated phospholipid bilayers. 21st International Symposium on Bioelectrochemistry and Bioenergetics of the Bioelectrochemical Society. Kraków, Poland.
4. Romeo S, Wu YS, **Levine ZA**, and Vernier PT. 2011. Water influx after nanoelectropermeabilization. International Bioelectrics Symposium. Toulouse, France.

5. JH Lee, **ZA Levine**, PT Vernier, M Tokman, M Colvin. 2010. Electric Field Effects on Water and Water-Vacuum Interfaces in Molecular Dynamics Simulations. Biophysical Society Annual Meeting. San Francisco, CA, USA.
6. Vernier PT, **Levine ZA**, Wu YH, Joubert V, Ziegler MJ, Mir L, and Tieleman DP. 2009. Increased susceptibility of oxidized phospholipid bilayers to electropermeabilization. 20th International Symposium on Bioelectrochemistry and Bioenergetics. Sibiu, Romania

SKILLS

C, C++, Perl, Python, Java, Fortran, MPI, OpenMP, pThreads, CUDA, Matlab, R, GROMACS, CHARMM, AMBER, NAMD, LAMMPS, COMSOL, SQL, HTML, CSS, XML, Oracle RDBMS. Scientific visualization and image processing using VMD, VisIt, and OpenGL. Experience with UTMOST and BSIM for SPICE modeling.