

Jacob Davidson

Curriculum Vitae

March 2016

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Education

- 2014 **Ph.D. Aerospace Engineering** University of Michigan
Thesis: Multiscale modeling and simulation of crosslinked polymers
- 2013 **M.S. Physics** University of Michigan
- 2010 **M.S. Mechanical Engineering** Virginia Tech
Thesis: Actuation and charge transport modeling of ionic liquid-ionic polymer transducers
- 2007 **B.S. Physics and Computer Science** University of Mary Washington

Professional experience

- 2014-present Postdoctoral scholar, Center for Neuroscience, UC Davis, Davis, CA
- 2009-2014 Graduate student researcher, University of Michigan, Ann Arbor, MI
- 2007-2009 Graduate student researcher, Virginia Tech, Blacksburg, VA
- Summer 2007 Test Engineer at Envisioneering, Inc., NAVSEA, Dahlgren, VA
- 2006-2007 Partner/web developer, Davidson Digital

Honors, awards, and fellowships

- 2015 Presentation featured as "starred" at Conference Complex Systems 2015
- 2012 Aerospace Engineering department nominee, Richard and Eleanor Towner Prize for Outstanding PhD Research
- 2012, 2013 Rackham Conference Travel Grant recipient
- 2009 Outstanding graduate student mentor award, SURP program at Virginia Tech
- 2007 Inducted to Phi Beta Kappa honor society
- 2003-2005 University of Mary Washington Alumni Academic Scholarship

Refereed research papers

1. J. D. Davidson and N. C. Goulbourne. Microscopic mechanisms of the shape memory effect in crosslinked polymers. *Smart Materials and Structures* **24**(5) (May 2015), 055014.
2. J. D. Davidson and N. Goulbourne. A nonaffine network model for elastomers undergoing finite deformations. *Journal of the Mechanics and Physics of Solids* **61**(8) (Aug. 2013), 1784–1797.
3. A. J. Skulborstad, Y. Wang, J. D. Davidson, S. M. Swartz, and N. C. Goulbourne. Polarized Image Correlation for Large Deformation Fiber Kinematics. en. *Experimental Mechanics* (2013).
4. J. D. Davidson and N. C. Goulbourne. Boundary layer charge dynamics in ionic liquid-ionic polymer transducers. *Journal of Applied Physics* **109**(1) (Jan. 2011), 014909.
5. J. D. Davidson and N. C. Goulbourne. Nonlinear capacitance and electrochemical response of ionic liquid-ionic polymers. *Journal of Applied Physics* **109** (2011), 084901.
6. J. D. Davidson and N. C. Goulbourne. The influence of microstructure on boundary layer interactions in ionic polymer transducers. *International Journal of Applied Mechanics* **03** (2011), 365.

Papers submitted

1. J. D. Davidson, R. P. Arauco-Aliaga, S. Crow, D. M. Gordon, and M. S. Goldman. *An individual-based model of the regulation of foraging activity by interactions in harvester ant colonies*. Submitted to PLoS Computational Biology.

Conference proceedings, presentations, and posters

1. J. D. Davidson and M. S. Goldman. Determining the robust and sloppy features of a neural integrator circuit's connectivity matrix. In: *CoSynE workshop on "Sloppy models in systems neuroscience"*. Snowbird, Utah, Feb. 2016.

2. E. R. Aksay, J. D. Davidson, and M. S. Goldman. Network architectures underlying persistent neural activity. In: *Connecting Network Architecture and Network Computation*. BIRS. Banff, Alberta, Canada, Dec. 2015.
3. J. D. Davidson, R. P. Arauco, D. M. Gordon, and M. S. Goldman. Ant colonies and neural networks: collective decision-making using simple messages. In: *Conference on Complex Systems*. Sept. 2015.
4. J. D. Davidson and N. C. Goulbourne. Microscopic mechanisms of the shape memory effect in crosslinked polymers. In: *Proc. ICAST*. Aruba, Oct. 2013.
5. J. D. Davidson, Y. Li, and N. C. Goulbourne. The shape memory effect in crosslinked polymers: effects of polymer chemistry and network architecture. In: *Proc. SPIE*. Volume 8689. Apr. 2013.
6. J. D. Davidson and N. C. Goulbourne. A complex network analysis of crosslinked polymers. In: *Modeling Soft Matter*. University of California-Santa Barbara, Santa Barbara, CA, June 2012.
7. J. D. Davidson and N. C. Goulbourne. Connecting Chain Chemistry and Network Topology With the Large Deformation Mechanical Response of Elastomers. In: *Proc. ASME IMECE*. Nov. 2012.
8. J. D. Davidson and N. C. Goulbourne. Microscale deformation mechanisms in rubber elastomers. In: *Society of Engineering Science (SES)*. Northwestern University, Evanston, IL, Oct. 2011.
9. J. D. Davidson and N. C. Goulbourne. Actuation and charging characteristics of ionic liquid-ionic polymer transducers. In: *Proc. ASME SMASIS*. Philadelphia, PA, USA, 2010.
10. J. D. Davidson and N. C. Goulbourne. Electromechanical Coupling in Ionic Polymer-Metal Composites. In: *Proc. ASME IMECE*. 2010, pp.723–735.
11. J. D. Davidson and N. C. Goulbourne. Nonlinear capacitance and electrochemical behavior of ionic liquid-ionic polymer transducers. In: *Proc. SPIE*. Volume 7642. San Diego, CA, USA, 2010.
12. J. D. Davidson and N. C. Goulbourne. Ion transport in ionic liquid-swollen ionic polymer transducers. In: *Proc. SPIE*. Volume 7289. San Diego, CA, USA, 2009, pp.72891F.
13. J. D. Davidson and N. C. Goulbourne. A modified micromechanical model of ionic polymer-metal composite actuation. In: *Proc. ASME SMASIS*. Ellicott City, Maryland, Oct. 2008.

PhD and master's thesis

1. J. D. Davidson. "Multiscale modeling and simulation of crosslinked polymers". PhD thesis. University of Michigan, 2014.
2. J. D. Davidson. "Actuation and Charge Transport Modeling of Ionic Liquid-Ionic Polymer Transducers". Master's thesis. Virginia Tech, 2010.

Academic involvement

- Organizing committee, UC Davis Postdoctoral Research Symposium
- Organizing committee and session organizer, Michigan Engineering Graduate Symposium
- Complex systems advanced academic workshop (CSAAW) at Michigan
- Officer in student chapter of American Society for Engineering Education (ASEE) at Michigan

Teaching experience

- Developed and taught *Introduction to Mathematica* and *Equation solving in Mathematica* workshops with ASEE at Michigan
- Winter 2010, Fall 2013: Graduate student instructor for AERO 305 (Aero. Eng. Laboratory I)
- Winter 2011: Graduate student instructor for AERO 405 (Aero. Eng. Laboratory II)