Steven Strong

Curriculum Vitae

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Education

2017 **Ph.D. Chemical Physics**, *University of Colorado Boulder*, Boulder, CO.
Advisor: Joel Eaves

2012 **B.S. Chemistry**, *Colorado School of Mines*, Golden, CO.
Summa Cum Laude
Minor: Mathematical Sciences

Areas of Expertise

Molecular Simulation, Nonequilibrium Dynamics, Theoretical Spectroscopy

Research Experience

2020– **Invitae (originally ArcherDX)**, *Boulder, CO*, Bioinformatics Scientist.
Supervisors: Abel Licon, Margaret Gruca

2018–2020 **University of Chicago**, *Chicago, IL*, Postdoctoral Scholar.
Advisor: James Skinner
My current research uses molecular simulation and theoretical spectroscopic prediction to study a wide array of complex systems. For example, I have applied these techniques to understand the hydrogen bonding network in supercritical water and the mechanism for ion transport through potassium channels in the cell membrane. I am also extending the theoretical spectroscopy method to study UV/Vis spectroscopy and charge transport in organic semiconductors.

2012–2017 **University of Colorado Boulder**, *Boulder, CO*, Graduate Research Assistant.
Advisor: Joel Eaves
Thesis: "Molecular Dynamics in Mesoscopic Equilibrium and Nonequilibrium Systems with Applications in Sustainability"
In my graduate research, I studied systems with applications in solar energy and water purification. To this end, I developed a rigorous molecular dynamics method for the study of nonequilibrium flow with atomistic resolution. I found that the equilibrium hydrophobic effect has a nonequilibrium analog for water flowing through nanoscopic membranes, and I developed a linear response theory to understand this flow.

2011–2012 **Colorado School of Mines**, *Golden, CO*, Undergraduate Research Assistant.
Advisors: Mark Seger and Matt Posewitz
I used nuclear magnetic resonance (NMR) to study algal starch branching ratios, with applications in bioengineering algae for biofuel production.

2007–2012 **United States Geological Survey**, *Lakewood, CO*, Physical Science Technician.
Advisors: Geoff Plumlee and Todd Hoefen
I performed lab work and data analysis for research projects investigating the health and environmental effects of fire ash, mine tailings, and other natural disasters.

Honors and Awards

2017 **Young Investigator Award** at Gordon Research Conference on the Chemistry and Physics of Liquids

2014–2017 **National Science Foundation Graduate Research Fellow**

2015 Accepted to and attended **Telluride School on Theoretical Chemistry**

2012 **Most Outstanding Graduating Chemistry Student**, Colorado School of Mines

Contributions to Funding Applications

2019 Midway Compute Cluster Research II Allocation **Status**: Approved

2018 Midway Compute Cluster Research II Allocation **Status**: Approved

2017 AFOSR Grant for the Chemistry & Physics of Liquids GRC/GRS # FA9550-17-1-0281 **Status**: Funded

2016 Janus Supercomputer Allocation **Status**: Approved

2016 University of Colorado Graduate School Travel Grant **Status**: Funded

2016 University of Colorado Research Computing General Allocation **Status**: Funded

2015 University of Colorado UGGS Travel Grant **Status**: Funded

2015 University of Colorado Research Computing General Allocation **Status**: Funded

2015 Janus Supercomputer Allocation **Status**: Approved

2015 NASA Exobiology Notice of Intent **Status**: Full proposal invited but not funded

2014 Janus Supercomputer Allocation **Status**: Approved

2014 XSEDE Allocation TG-CHE140096 **Status**: Approved

2014 NSF Graduate Research Fellowship **Status**: Funded

Professional Service

2018– **Organizer** University of Chicago Computations in Science Seminar

2018 **Poster Judge** Midwest Theoretical Chemistry Conference

2018 **Proctor** University of Chicago bridge club

2017 **Co-chair** Gordon Research Seminar on the Chemistry and Physics of Liquids

2017– **Reviewer** J. Chem. Phys., J. Mol. Liq., Soft Matter

2015 **Assistant** *CU Wizards* interactive science shows for grade school children.

Publications

*These authors contributed equally

1. *__Strong, S. E.__ & *Hestand, N. J. Modeling nonlocal electron–phonon coupling in organic crystals using interpolative maps: The spectroscopy of crystalline pentacene and 7,8,15,16-tetraazaterrylene. *J. Chem. Phys.* **153**(12), 124113. 10.1063/5.0021731 (2020).

2. Hoenig, E., **Strong, S. E.**, Wang, M., Radhakrishnan, J. M., Zaluzec, N. J., Skinner, J. L. & Liu, C. Controlling the hydration dependent morphology of MoS_2 membranes using surface functionalization. *Submitted* (2020).

3. Kananenka, A. A., **Strong, S. E.** & Skinner, J. L. Dephasing and Decoherence

in Vibrational and Electronic Line Shapes. *J. Phys. Chem. B* **124**(8), 1531–1542. 10.1021/acs.jpcb.9b11655 (2020).

4. *__Strong, S. E.__, *Hestand, N. J., Kananenka, A. A., Zanni, M. T. & Skinner, J. L. IR Spectroscopy Can Reveal the Mechanism of K^+ Transport in Ion Channels. *Biophys. J.* **118**(1), 254–261. 10.1016/j.bpj.2019.11.013 (2020). ***Cover Article***.

5. *Hestand, N. J., *__Strong, S. E.__, Shi, L. & Skinner, J. L. Mid-IR spectroscopy of supercritical water: From dilute gas to dense fluid. *J. Chem. Phys.* **150**(5), 054505. 10.1063/1.5079232 (2019).

6. **Strong, S. E.**, Shi, L. & Skinner, J. L. Percolation in supercritical water: Do the Widom and percolation lines coincide? *J. Chem. Phys.* **149**(8), 084504. 10.1063/1.5042556 (2018).

7. Cline, R. P., Utterback, J. K., **Strong, S. E.**, Dukovic, G. & Eaves, J. D. On the nature of trapped-hole states in CdS nanocrystals and the mechanism of their diffusion. *J. Phys. Chem. Lett.* **9**(12), 3532–3537. 10.1021/acs.jpclett.8b01148 (2018).

8. **Strong, S. E.** & Eaves, J. D. Linear response theory for water transport through dry nanopores. *J. Phys. Chem. A* **121**(29), 5377–5382. 10.1021/acs.jpca.7b03192 (2017).

9. **Strong, S. E.** & Eaves, J. D. The dynamics of water in porous two-dimensional crystals. *J. Phys. Chem. B* **121**(1), 189–207. 10.1021/acs.jpcb.6b09387 (2017).

10. **Strong, S. E.** & Eaves, J. D. Atomistic hydrodynamics and the dynamical hydrophobic effect in porous graphene. *J. Phys. Chem. Lett.* **7**(10), 1907–1912. 10.1021/acs.jpclett.6b00748 (2016).

11. **Strong, S. E.** & Eaves, J. D. Tetracene aggregation on polar and nonpolar surfaces: Implications for singlet fission. *J. Phys. Chem. Lett.* **6**(7), 1209–1215. 10.1021/acs.jpclett.5b00141 (2015).

Presentations

Oral Presentations

2019 "Supercritical Water: From Universality to Personality," University of Chicago *MRSEC Baglunch*. Chicago, Illinois. June 21, 2019.

2019 "The Dynamics of Water in Porous 2d Crystals," Gordon Research Conference, Chemistry and Physics of Liquids. Holderness, New Hampshire. August 6–11, 2017.

2019 "Tennis with Water Molecules: IR Spectroscopy of Supercritical Water," *Midwest Thermodynamics and Statistical Mechanics Meeting*. Champaign, Illinois. June 2–4, 2019

2018 "Hydrogen Bond Percolation in Supercritical Water," *Midwest Theoretical Chemistry Conference*. Chicago, Illinois. June 21–23, 2018.

2016 "The Dynamical Hydrophobic Effect in Nanoporous Graphene," Colorado Section of the American Chemical Society, Young Talent in Colorado and Beyond. Colorado State University, Fort Collins, Colorado. August 4–5, 2016.

2016 "The Dynamical Hydrophobic Effect in Nanoporous Graphene," Gordon Research Conference, Molecular Interactions and Dynamics. Easton, Massachusetts. July 11–15, 2016.

2015 "Tetracene Aggregation on Polar and Nonpolar Surfaces," *Singlet Fission Workshop*. Lyons, Colorado. June 21–23, 2015.

Poster Presentations

2019 "Hydrogen Bonding in Supercritical Water," Gordon Research Seminar and Gordon Research Conference, *Chemistry and Physics of Liquids*. Holderness, New Hampshire. August 3–9, 2019.

2019 "Hydrogen Bonding in Supercritical Water," *Berekely Stat Mech Meeting*. University of California, Berkeley, California. January 11–13, 2019.

2018 "Hydrogen Bond Percolation in Supercritical Water," Gordon Research Seminar and Gordon Research Conference, *Water and Aqueous Solutions*. Holderness, New Hampshire. July 21–27, 2018.

2017 "The Dynamics of Water in Porous 2d Crystals," Gordon Research Conference, *Chemistry and Physics of Liquids*. Holderness, New Hampshire. August 6–11, 2017. **Poster Prize**.

2017 "The Dynamics of Water in Porous 2d Crystals," *Berekely Stat Mech Meeting*. University of California, Berkeley, California. January 13–15, 2017.

2016 "Water Passage Through Atomically Thin Membranes: The Effects of Hydrophobicity," *Berekely Stat Mech Meeting*. University of California, Berkeley, California. January 8–10, 2016.

2015 "Water Passage Through Atomically Thin Membranes: The Effects of Hydrophobicity," *Telluride School on Theoretical Chemistry*. Telluride, Colorado. July 12–18, 2015.

2015 "Water Passage Through Atomically Thin Membranes: The Effects of Hydrophobicity," Gordon Research Seminar and Gordon Research Conference, *Chemistry and Physics of Liquids*. Holderness, New Hampshire. June 31–August 8, 2015.

2014 "Geometries of Molecular Crystals and Aggregates," *Singlet Fission Workshop*. Lyons, Colorado. June 22–24, 2014.

2012 "Determination of Branching in Algal Starch Using Various NMR Techniques," *Undergraduate Research Poster Session*. Golden, Colorado. April 2012.

Teaching Experience

2017 **Workshop** Co-taught workshop on Brownian motion and stochastic systems

2014–2017 **Tutor** Tutored high-school and undergraduate students in courses ranging from high school chemistry through physical chemistry.

2013–2014 **Teaching Assistant** Undergraduate Physical Chemistry Lab, University of Colorado Boulder

2012–2013 **Teaching Assistant** Undergraduate General Chemistry Lab, University of Colorado Boulder

Pedagogical Training

2019 Fundamentals of Teaching in STEM workshop series, University of Chicago

2019 Creating Lesson Plans Workshop, University of Chicago

2019 Workshop on Teaching Portfolios, University of Chicago

2014 Workshop on Grading STEM Labs, University of Colorado Boulder

2012 Intensive on Teaching Chemistry Labs, University of Colorado Boulder