

David Reid Jacobson, Ph.D.

Assistant Professor
Department of Chemistry
Clemson University

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Education:

Ph.D. in Physics, University of California, Santa Barbara (2011–2016)
Advisor: Omar A. Saleh

B.A. *cum laude* with Distinction in Physics and with Distinction in Biochemistry,
University of Pennsylvania (2007–2011)

Employment:

Assistant Professor, Department of Chemistry, Clemson University (2023–
Present)

Postdoctoral Research Associate, JILA, National Institute of Standards and
Technology and University of Colorado, Boulder (2017–2022)
Advisor: Thomas T. Perkins

Honors and Awards:

NIH K99/R00 Pathway to Independence Award (2021–Present)

APS DBIO Award for Outstanding Doctoral Thesis Research in
Biological Physics (2017)

NIST NRC Postdoctoral Research Associateship (2017–2019)

NSF Graduate Research Fellowship (2013–2016)

Chair's Award, Biochemistry Program, University of Pennsylvania (2011)

Roy and Diana Vagelos Molecular Life Science Program, University of
Pennsylvania (2007–2011)

Publications:

D.R. Jacobson, T.T. Perkins, “Quantifying a light-induced energetic change in bacteriorhodopsin by force spectroscopy”, *Proc. Natl. Acad. Sci. U.S.A.* **121**, e2313818121 (2024).

S.N. Innes-Gold, D.R. Jacobson, P.A. Pincus, M.J. Stevens, O.A. Saleh, “Flexible, charged biopolymers in monovalent and mixed-valence salt: Regimes of anomalous electrostatic stiffening and salt insensitivity”, *Phys. Rev. E* **104**, 014504 (2021).

D.R. Jacobson, T.T. Perkins, “Free-energy changes of bacteriorhodopsin point mutants measured by single-molecule force spectroscopy”, *Proc. Natl. Acad. Sci. U.S.A.* **118**, e2020083118 (2021).

D.R. Jacobson, T.T. Perkins, “Correcting molecular transition rates measured by single-molecule force spectroscopy for limited temporal resolution”, *Phys. Rev. E* **102**, 022402 (2020).

*Co-first
authors

H. Yu*, D.R. Jacobson*, H. Luo, T.T. Perkins, “Quantifying the native energetics stabilizing bacteriorhodopsin by single-molecule force spectroscopy”, *Phys. Rev. Lett.* **125**, 068102 (2020).

D.R. Jacobson, L. Uyetake, T.T. Perkins, “Membrane-protein unfolding intermediates detected with enhanced precision using a zigzag force ramp”, *Biophys. J.* **118**, 667–675 (2020).

D.R. Jacobson, D.B. McIntosh, M.J. Stevens, M. Rubinstein, O.A. Saleh, “Single-stranded nucleic acid elasticity arises from internal electrostatic tension”, *Proc. Natl. Acad. Sci. U.S.A.* **114**, 5095–5100 (2017).

D.R. Jacobson, O.A. Saleh, “Counting the ions surrounding nucleic acids”, *Nucleic Acids Res.* **45**, 1596–1605 (2017).

D.R. Jacobson, O.A. Saleh, “Magnetic tweezers force calibration for molecules that exhibit conformational switching”, *Rev. Sci. Instrum.* **87**, 094302 (2016).

D.R. Jacobson, O.A. Saleh, “Quantifying the ion atmosphere of unfolded, single-stranded nucleic acids using equilibrium dialysis and single-molecule methods”, *Nucleic Acids Res.* **44**, 3763-3771 (2016).

C.-Y. Park, D.R. Jacobson, D.T. Nguyen, S. Willardson, O.A. Saleh, “A thin permeable-membrane device for single-molecule manipulation”, *Rev. Sci. Instrum.* **87**, 014301 (2016).

D.R. Jacobson, O.A. Saleh, “Measuring the differential stoichiometry and energetics of ligand binding to macromolecules by single-molecule force spectroscopy: An extended theory”, *J. Phys. Chem. B* **119**, 1930-1938 (2015).

D.R. Jacobson, D.B. McIntosh, O.A. Saleh, “The snakelike chain character of unstructured RNA”, *Biophys. J.* **105**, 2569-2576 (2013).

J.L. Sievers, et al., “The Atacama Cosmology Telescope: Cosmological parameters from three seasons of data”, *J. Cosmol. Astropart. P.* **10**, 060 (2013).

L. Laureano-Perez, R. Collé, D.R. Jacobson, R. Fitzgerald, N.S. Kahn, I.J. Dmochowski, “A novel application for ^{222}Rn emanation standards: Radon-cryptophane host chemistry”, *Appl. Radiat. Isotopes* **70**, 1997-2001 (2012).

*Co-first
authors

D.R. Jacobson*, N.S. Kahn*, R. Collé, R. Fitzgerald, L. Laureano-Pérez, Y. Bai, I.J. Dmochowski, “Measurement of radon and xenon binding to a cryptophane molecular host”, *Proc. Natl. Acad. Sci. U.S.A.* **108**, 10969-10973 (2011).

Research Support: NIH 1 K99 GM140439 D.R. Jacobson (PI) 3/1/2021–
NIH 4 R00 GM140439 8/31/2026

Single-molecule measurements of membrane-protein folding and ligand-interaction energetics in bacteriorhodopsin and the diabetes-insipidus-involved vasopressin receptor 2

Total costs: \$920,230

Research Talks:

Invited:

- “Measuring membrane protein energetics using single-molecule force spectroscopy”, Biophysics Seminar, Department of Physics and Astronomy, Clemson University, Clemson, SC (2023).
- “Probing the energetics and light-driven dynamics of bacteriorhodopsin by force spectroscopy”, Colorado Single Molecules and Membranes Meeting, Denver, CO (2022).
- “Probing the energetics of single membrane proteins by atomic force microscopy” [Faculty candidate talk] (2021–2022)
 - School of Applied and Engineering Physics, Cornell University, Ithaca, NY
 - Department of Biochemistry and Molecular Biology, Rutgers Robert Wood Johnson Medical School, Piscataway, NJ
 - Department of Physics, Brown University, Providence, RI
 - Department of Chemistry, Clemson University, Clemson, SC
 - Department of Biological Chemistry, University of Michigan Medical School, Ann Arbor, MI
 - Thomas C. Jenkins Department of Biophysics, Johns Hopkins University, Baltimore, MD
 - Department of Chemistry, University of Kansas, Lawrence, KS
 - Department of Chemistry, University of Washington, Seattle, WA
 - Department of Physiology and Biophysics, Boston University School of Medicine, Boston, MA

- “Unfolding free-energy changes of membrane-protein point mutants measured by AFM”, Colorado Single Molecules and Membranes Meeting, Denver, CO (2020)
- “Single-stranded nucleic acid elasticity arises from internal electrostatic tension” [Award lecture], APS March Meeting, Los Angeles, CA (2018)

Contributed:

- “Quantifying a light-induced energetic change in bacteriorhodopsin by force spectroscopy”, Membrane Protein Folding Gordon Research Conference, Castelldefels, Spain (2023)
- “Measuring equilibrium unfolding free energy changes of membrane proteins by single-molecule force spectroscopy”, Protein Folding Dynamics Gordon Research Seminar, Ventura, CA (2022)
- “Quantifying the ion atmosphere of unfolded, single-stranded nucleic acids”, Biophysical Society Meeting, Los Angeles, CA (2016)
- “Using single-molecule ligand counting to quantify the ion atmosphere of nucleic acids”, International Chemical Congress of Pacific Basin Societies, Honolulu, HI (2015)

**Teaching
Experience:**

Courses taught: (Clemson University)

- Physical Chemistry II [CH 3320, engineering section] (Spring 2024)
- Special Topics: Scanning Probe Microscopy [CH 9300 002] (Spring 2023)

Professional development:

- TA for three quarters of introductory physics lab (UCSB, 2011–12)
- Advised four undergraduate researchers and one high-school student as a Ph.D. student and postdoc (UCSB & JILA, 2013–2022)
- Evidence-Based Introduction to Teaching Workshop (CU Boulder, 2018)
- CIMER Entering Mentorship Workshop (JILA, 2020)

**Research
Mentorship:**

Ph.D. students:

- Abideen Ayangbemi (2023–Present)
- Christopher Hatchell (2023–Present)
- Thomas Courtney (2024–Present)

Undergraduate students:

- Kelley Coulman (2023–Present)

REU students:

- Alexandra Reece (2023)

Service to Science: Reviewer, National Science Foundation

Reviewer, *ACS Nano*
Biophys. J.
J. Am. Chem. Soc.

Phys. Rev. Lett.
Phys. Rev. Research
PRX Life

**Department/
University Service**

Departmental committee service

- Graduate recruitment committee (2023–Present)
- Analytical/physical student seminar committee (2023–Present, co-chair)
- Chemistry seminar committee (2023–Present)
- Physical chemistry faculty search committee (2023–Present)
- Chair’s advisory committee (2024–Present)
- Instrumentation committee (2023)
- Ad-hoc physical-chemistry interview committee (2023)

Doctoral dissertation committees (L.C.; Z.K.; A.L.; H.S.)