

SHIXIN LIU

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POSITION

The Rockefeller University 2016—present
Assistant Professor
Head, Laboratory of Nanoscale Biophysics and Biochemistry
Faculty Member, Tri-Institutional PhD Program in Chemical Biology

ACADEMIC TRAINING

University of California, Berkeley 2010—2015
Postdoctoral Fellow
Advisor: Carlos Bustamante
Research Topic: Using single-molecule manipulation methods to study mechanical processes driven by biomolecular motors.

Harvard University 2003—2009
Ph.D., Chemistry
Advisor: Xiaowei Zhuang
Dissertation: Single-molecule fluorescence studies of enzyme kinetics and protein-nucleic acid interactions.

University of Science and Technology of China 1998—2003
B.S., Biological Sciences
Advisor: Mian Wu
Thesis Topic: Function and regulation of apoptotic proteins.

HONORS

2017 Kimmel Scholar, Sidney Kimmel Foundation
2017 Basil O'Connor Starter Scholar Research Award, March of Dimes Foundation
2017 Quadrivium Award for Innovative Research in Epigenetics, The Quadrivium Foundation
2016 Monique Weill-Caulier Career Scientist Award, The Hirschl/Weill-Caulier Trusts
2013 NIH Pathway to Independence Award (K99/R00), National Institute of General Medical Sciences
2012 Education Travel Award, Biophysical Society

2008 Chinese Government Award for Outstanding Students Abroad
2003 Fieser Graduate Research Grant, Harvard University
1998 Ranked #1 in the Special Class for the Gifted Young, Top Freshman Scholarship,
University of Science and Technology of China

PUBLICATIONS (* denotes co-first author; # denotes co-corresponding author)

1. **S. Liu**#, S. Tafoya, C. Bustamante#. (2017) Deciphering the molecular mechanism of the bacteriophage ϕ 29 DNA packaging motor. *Methods Mol. Biol.* 1486, 343-355.
2. B. Cheng, S. Wu, **S. Liu**, P. Rodriguez-Aliaga, J. Yu, S. Cui. (2015) Protein denaturation at a single-molecule level: the effect of nonpolar environments and its implications on the unfolding mechanism by proteases. *Nanoscale* 7, 2970-2977.
3. **S. Liu***, G. Chistol*, C. L. Hetherington*, S. Tafoya, K. Aathavan, J. Schnitzbauer, S. Grimes, P. J. Jardine, C. Bustamante. (2014) A viral packaging motor varies its DNA rotation and step size to preserve subunit coordination as the capsid fills. *Cell* 157, 702-713.
4. **S. Liu***, G. Chistol*, C. Bustamante. (2014) Mechanical operation and intersubunit coordination of ring-shaped molecular motors: insights from single-molecule studies. *Biophys. J.* 106, 1844-1858.
5. M. Dangkulwanich*, T. Ishibashi*, **S. Liu***, M. L. Kireeva, L. Lubkowska, M. Kashlev, C. Bustamante. (2013) Complete dissection of transcription elongation reveals slow translocation of RNA polymerase II in a linear ratchet mechanism. *eLife* 2, e00971.
6. G. Chistol*, **S. Liu***, C. L. Hetherington, J. R. Moffitt, S. Grimes, P. J. Jardine, C. Bustamante. (2012) High degree of coordination and division of labor among subunits in a homomeric ring ATPase. *Cell* 151, 1017-1028.
7. **S. Liu***, B. T. Harada*, J. T. Miller, S. F. Le Grice, X. Zhuang. (2010) Initiation complex dynamics direct the transitions between distinct phases of early HIV reverse transcription. *Nat. Struct. Mol. Biol.* 17, 1453-1460.
8. S. Chung, M. Wendeler, J. W. Rausch, G. Beilhartz, M. Gotte, B. R. O'Keefe, A. Bermingham, J. A. Beutler, **S. Liu**, X. Zhuang, S. F. Le Grice. (2010) Structure-activity analysis of vinylogous urea inhibitors of human immunodeficiency virus-encoded ribonuclease H. *Antimicrob. Agents Chemother.* 54, 3913-3921.
9. J. W. Rausch, E. A. Abbondanzieri, **S. Liu**, X. Zhuang, S. F. Le Grice. (2010) Retrovirus replication: new perspectives on enzyme and substrate dynamics. In *Recent Advances in Human Retroviruses: Principles of Replication and Pathogenesis* (eds. A. Lever, K. T. Jeang, B. Berkhout. World Scientific), pp. 307-343.
10. **S. Liu**, E. A. Abbondanzieri, J. W. Rausch, S. F. Le Grice, X. Zhuang. (2008) Slide into action: dynamic shuttling of HIV reverse transcriptase on nucleic acid substrates. *Science* 322, 1092-1097.
11. **S. Liu**, G. Bokinsky, N. G. Walter, X. Zhuang. (2007) Dissecting the multistep reaction pathway of an RNA enzyme by single-molecule kinetic "fingerprinting". *Proc. Natl. Acad. Sci. U. S. A.* 104, 12634-12639.
12. G. Bokinsky, L. G. Nivón, **S. Liu**, G. Chai, M. Hong, K. M. Weeks, X. Zhuang. (2006) Two distinct binding modes of a protein cofactor with its target RNA. *J. Mol. Biol.* 361, 771-784.

13. Z. Song, **S. Liu**, H. He, N. Hoti, Y. Wang, S. Feng, M. Wu. (2004) A single amino acid change (Asp53→Ala53) converts Survivin from anti-apoptotic to pro-apoptotic. *Mol. Biol. Cell* 15, 1287-1296.

INVITED TALKS

- Nov 2016 University of Maryland, College Park, MD
Jul 2015 Peking Union Medical College, Beijing, China
Jun 2015 Tsinghua University, Beijing, China
Jun 2015 Peking University, Beijing, China
Mar 2015 California Institute of Technology, Pasadena, CA
Mar 2015 University of California, San Diego, San Diego, CA
Jan 2015 University of Texas Southwestern Medical Center, Dallas, TX
Jan 2015 Massachusetts Institute of Technology, Cambridge, MA
Dec 2014 University of Michigan, Ann Arbor, MI
Sep 2014 The Rockefeller University, New York, NY
Jan 2013 Shanghai Jiao Tong University, Shanghai, China
Jul 2009 University of Science and Technology of China, Hefei, China
Aug 2007 American Chemical Society National Meeting, Boston, MA

TEACHING

- 2017 Lecturer, Chemical Biology, Rockefeller University
2017 Lecturer, Biochemical and Biophysical Methods, Rockefeller University
2015, 2016 Lecturer, Seminars on Modern Biology, Rockefeller University
2014 Guest Lecturer, Introduction to Graduate Research in Physics, Physics 251, UC Berkeley
2012 Co-advisor, Readings on Single Molecule Biophysics, MCB 290, UC Berkeley
2011, 2014 Guest Lecturer, Physical Biochemistry, MCB 206, UC Berkeley
2003, 2004 Teaching Assistant, Principles of Chemistry, Chemistry 7, Harvard