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Laboratory of Chemistry and Cell Biology
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EDUCATION

Ph.D. Physics, **Cornell University** 2009
B.A. Physics / B.M. Music Performance, **Oberlin College** 2002

RESEARCH EXPERIENCE

Post-doctoral Researcher – **Rockefeller University** 2010 – present
NIH NRSA Postdoctoral Fellowship (2011-2014)
In the Laboratory of Tarun Kapoor, *Laboratory of Chemistry and Cell Biology*

Graduate Student/Research Associate – **Cornell University** 2004 – 2010
In the Laboratory of Michelle D. Wang, *HHMI / Laboratory of Solid State Physics*

FELLOWSHIPS AND AWARDS

- National Institutes of Health NRSA Postdoctoral Fellowship, 2011–2014
- Sigma Xi Scientific Honor Society
- Robert Weinstock Prize for Excellence in Physics
- Graduated Summa Cum Laude from Oberlin College

PUBLICATIONS

Y. Shimamoto*, **S. Forth***, T.M. Kapoor (*co-first authors)
Measuring pushing and braking forces generated by ensembles of kinesin-5 crosslinking two microtubules
Developmental Cell **34**, 669-681 (2015).

- highlighted in *Dev. Cell Preview* **34**, 609-610 (2014)

S. Forth, K.-C. Hsia, Y. Shimamoto, T.M. Kapoor
Asymmetric friction of non-motor MAPs can lead to their directional motion in active microtubule networks
Cell **157**, 420-32 (2014).

- highlighted in *Dev. Cell Preview* **29**, 5-6 (2014)
- Faculty of 1000 recommended

K.-C. Hsia, E.M. Wilson-Kubalek, A. Dottore, Q. Hao, K.-L. Tsai, **S. Forth**, Y. Shimamoto, R.A. Milligan,
and T.M. Kapoor
Reconstitution of the augmin complex provides insights into its architecture and function
Nature Cell Biology **16**, 852-863 (2014).

S.-C. Ti, M.C. Pamula, S.C. Howes, C. Duellberg, N.I. Cade, R.E. Kleiner, **S. Forth**, T. Surrey, E. Nogales
and T.M. Kapoor
Disease-related mutations in human tubulin proximal to the kinesin binding site alter dynamic instability
In preparation (2015).

M. Li, A. Hada, P. Sen, L. Olufemi, M.A. Hall, B.Y. Smith, **S. Forth**, J.N. McKnight, A. Patel, G.D.
Bowman, B. Bartholomew, M.D. Wang
Dynamic regulation of transcription factors by nucleosome remodeling
eLife 2015;4:e06249 (2015).

S. Forth, M.Y. Sheinin, J.T. Inman, and M.D. Wang
Torque Measurement at the Single Molecule Level
Annual Review of Biophysics **42**, 583-604 (2013).

S. Forth and M.D. Wang
Angular Optical Trapping
Encyclopedia of Biophysics, Springer Reference, (2012).

S. Forth, C. Deufel, S.S. Patel, M.D. Wang
Direct Measurements of Torque during Holliday Junction Migration
Biophysical Journal **100**, L05-L07 (2011).

M. Sheinin, **S. Forth**, J.F. Marko, and M.D. Wang
Underwound DNA under Tension: Structure, Elasticity, and Sequence-Dependent Behaviors
Physical Review Letters **107**:108102 (2011).

J. Inman*, **S. Forth***, and M.D. Wang (*contributed equally to this work)
Passive Torque Wrench and Angular Position Detection Using a Single Beam Optical Trap
Optics Letters **35**:17, 2949-51 (2010).

B. Daniels, **S. Forth**, M.Y. Sheinin, M.D. Wang and J.P. Sethna
Discontinuities at the DNA Supercoiling Transition
Physical Review E **80**:040901 (2009).

S. Forth, C. Deufel, M.Y. Shienin, B. Daniels, J.P. Sethna and M.D. Wang
Abrupt Buckling Transition Observed during the Plectoneme Formation of Individual DNA Molecules
Physical Review Letters **100**:148301 (2008).

C. Deufel, **S. Forth**, C.R. Simmons, S. Deigoshia and M.D. Wang
Nanofabricated quartz cylinders for angular optical trapping: torque detection during DNA supercoiling
Nature Methods **4**, 223-5 (2007).

O. Byl, P. Kondratyuk, **S. Forth**, S.A. Fitzgerald, L. Chen, J.K. Johnson and J.T. Yates, Jr.
Adsorption of CF₄ on the Internal and External Surfaces of Opened Single-Walled Carbon Nanotubes: A
Vibrational Spectroscopy Study
Journal of the American Chemical Society **125**, 5889 (2003).

S.A. Fitzgerald, **S. Forth** and M. Rinkoski
Induced infrared absorption of molecular hydrogen in solid C₆₀
Physical Review B **65**:140302 (2002).

SELECTED CONFERENCE PRESENTATIONS

S. Forth

Examining the Mechanics of Microtubule Networks
Stadtman Investigator Presentation Symposium, Biomedical Engineering/Biophysics/Physics
National Institutes of Health, Bethesda, MD; Dec. 16, 2014.

S. Forth and T.M. Kapoor

Asymmetric friction of non-motor MAPs can lead to their directional motion in active microtubule networks
Invited talk at 2013 American Society for Cell Biology, subgroup "Dynamics and Mechanics of Mitosis",
New Orleans, LA; Dec. 14, 2013

S. Forth, K.-C. Hsia, and T.M. Kapoor

Asymmetric Force Response Reveals Mechanical Role in Spindle Protein Localization
Talk presented at 2013 Biophysical Society Annual Meeting Conference, Philadelphia, PA; Feb. 6, 2013

S. Forth and T.M. Kapoor

Understanding Cell Division: The micromechanics of non-motor MAPs
Talk presented at 2012 Pels Family Chemical and Structural Biology Retreat
Edith Macy Conference Center, Briarcliff Manor, NY; November 17, 2012

S. Forth and T.M. Kapoor

The Micromechanics of Central Spindle Organization
Poster presented at 2011 Anderson Cancer Center Symposium
Rockefeller University, New York, NY; September 9, 2011.

S. Forth

The Micromechanics of Central Spindle Organization
Poster presented at 2011 Pels Family Chemical and Structural Biology Retreat
Edith Macy Conference Center, Briarcliff Manor, NY; April 30, 2011.

S. Forth

Angular Optical Trapping and its Application to DNA Structures
Poster presented at 2010 Howard Hughes Medical Institute Science Meeting
Howard Hughes Medical Institute, Chevy Chase, MD; January 24-27, 2010.

S. Forth

A Biological Nano-Torque Wrench: Holliday Junction Mechanics Studied Using an Angular Optical Trap
Talk presented at 13th annual Buffalo Symposium on DNA Replication and Repair
Roswell Park Cancer Institute, Buffalo, NY; May 15, 2009.

S. Forth, C. Deufel, and M.D. Wang

Holliday Junction Mechanics Studied Using an Angular Optical Trap
Poster presented at 2009 Biophysical Society Meeting Conference, Boston, MA; March 2, 2009.

S. Forth, C. Deufel, C.R. Simmons, S. Dejgosha and M.D. Wang

Angular Optical Trapping with Nanofabricated Quartz Cylinders: Measuring the Torsional Properties and
Plectoneme Dynamics of DNA
Poster presented at 2007 Biophysical Society Meeting Conference, Baltimore, MD; March 3, 2007.

S. Forth, C. Deufel and M.D. Wang

Angular Optical Trapping: Measuring the Twist Elasticity of DNA
Invited poster presentation at the inaugural Gordon Conference on Single Molecule Approaches to
Biology, Colby-Sawyer College, New London, NH; June 18-23, 2006.

TECHNICAL SKILLS

- Extensive experience with optics and microscopy techniques, including advanced optical trap design, lattice light sheet microscopy, TIRF microscopy, super-resolution methods (STORM), confocal fluorescence imaging
- Extensive experience with computer programming and theoretical/statistical modeling, including Python, LabView, C, C++, Java, R, Mathematica, Matlab, HTML
- Experience with biochemical/molecular biology techniques, including protein expression and purification, live mammalian cell imaging, cloning, Xenopus egg extract system, PCR, nucleosome assembly
- Experience with theoretical modeling, including formulation of computational models of cytoskeletal protein behavior, DNA mechanics, as well as statistical analysis of large data sets

TEACHING EXPERIENCE

Facilitator - Department of Physics, Cornell University
Teaching Assistant Training Program

Fall 2003

Teaching Assistant - Department of Physics, Cornell University

Physics 330: Modern Experimental Optics

Fall 2003

Physics 204: Physics of Musical Sound

Spring 2003

Physics 101: General Physics I

Fall 2002

PROFESSIONAL ASSOCIATIONS

- Biophysical Society
- American Society for Cell Biology
- American Physical Society

REFERENCES

Tarun M. Kapoor

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