# Steve Kuei, Ph.D

Lead Material Scientist, Rapid Liquid Print


## about

449 Canal St.
Apt. 635
Somerville, MA 02145

(609) 480-4313

kuei.steve@gmail.com
[www.skuei.com]


## languages

english
mandarin chinese

## programming

MATLAB
Mathematica
FORTRAN
Java
C++
Python
LaTeX

## instruments

AFM
confocal microscopy
TIRF microscopy
Rheology
SANS

## interests

complex fluid rheology, colloidal physics, single fiber dynamics and topology, fluid mechanics, Brownian dynamics and hydrodynamics simulations

## education

2013-2019 **Ph.D** in Chemical and Biomolecular Engineering — Rice University
GPA: 3.7
Selected coursework: Colloidal and Interfacial Phenomena, Biophysics, DNA Biotechnology and Modeling, Computational Fluid Dynamics, Rheology

2008–2012 **BSE** in Chemical Engineering — Princeton University
Certificates: Engineering Physics, Materials Science
GPA: 3.3
Selected Coursework: ODEs, PDEs, Organic Chemistry, Physical Chemistry, Polymers, Quantum Mechanics, Quantum Theory, Lagrangian Mechanics, General Relativity, Biophysics

## work

2023-present **Lead Material Scientist** — Rapid Liquid Print
Working on the embedded 3D printing of soft, flexible materials. In charge of gel bath and silicone 'ink' rheology tuning and development. Also in charge of printer material supply, our material portfolio, and chemical safety and hygiene.

## selected publications


Kuei, Steve, Paul Salipante, Ryan Murphy, Katie Weigandt, Steven D. Hudson. Probing the link between the microstructural behavior and bulk response of rod-like viruses at high shear rates via flow birefringence *In preparation.*

Aldo Spatafora-Salazar†, Steve Kuei†, Lucas H. P. Cunha and Sibani Lisa Biswal. Coiling of semiflexible paramagnetic colloidal chains. *Soft Matter,* **13** (2023), pp. 2385-2396. doi:10.1039/D3SM00066D †Authors contributed equally to this work.

Salipante, Paul, Steve Kuei, and Steven D. Hudson. A small-volume microcapillary rheometer. *Rheologica Acta,* **61** (2022), pp. 309-317. doi:10.1007/s00397-022-01333-4

Kuei, Steve, Burke Garza, and Sibani Lisa Biswal. From strings to coils: rotational dynamics of DNA-linked colloidal chains. *Physical Review Fluids,* **2** (2017), 104102. doi:10.1103/PhysRevFluids.2.104102

Kuei, Steve, Agnieska Słowicka, Maria Ekiel-Jeżewska, Eligiusz Wajnryb, Howard Stone. Dynamics and Topology of Flexible Chains in Steady Shear Flows. *New J. of Physics*, **17** (2015), 053009. doi:10.1088/1367-2630/17/5/053009.
*Highlighted in IOPselect, a special collection of journal articles chosen by the Editors for substantial advances, a high degree of novelty, and significant impact on future research.*

# research

2019-2022 **Polymers and Complex Fluids Group** National Institute of Standards and Technology
NRC Postdoctoral fellow, advised by Dr. Steven Hudson. Using Fd virus and its mutants as a model system for rods in solution, we investigate its complex fluid properties and microstructural evolution using capillary microrheology and simultaneous SANS.

2013-2019 **Soft Matter Laboratory** Biswal Group, Rice University
Magnetic fields are used to assemble linked colloidal chains, which are driven by rotating or oscillating external fields and flows. Chain dynamics are imaged and analyzed via confocal and light microscopy; observations and theory are augmented with Brownian Dynamics simulations.

2011-2013 **Complex Fluids Laboratory** Stone Group, Princeton University
Implemented HYDROMULTIPOLE algorithm to simulate single fiber dynamics in various simple flows. Resulting configurations were analyzed with particular emphasis on fiber orientation, shape, and topology.

06-12 2011 **Molecular and Cellular Biomechanics Laboratory** Valentine Group, UCSB
Mentor: Dezhi Yu. Used fluorescence microscopy (TIRF) to image microtubules under the influence of various MAPs and small molecules, such as tau and taxol. Helped develop an improved spectral decomposition algorithm to determine the fibers' mechanical properties.

2010-2011 **Organic and Polymer Electronics Laboratory** Loo Group, Princeton University
Deposited semi-conducting organic polymers, such as P3HT, using several methods (spin coating, dip coating, etc.) on substrates with non-zero gaussian curvature of various patterns. Used AFM to image and analyze the crystallized polymer and determine its mean orientation.

# additional publications

Hilou, Elaa, Steve Kuei, and Sibani Lisa Biswal. Interfacial energetics of two-dimensional colloidal clusters generated with a tunable anharmonic interaction potential. *Physical Review Materials,* **2** (2018), 025602. doi:10.1103/PhysRevMaterials.2.025602

Yu, Dezhi, Veronica Pessino, Steve Kuei, and Megan T. Valentine. Mechanical and Functional Properties of Epothilone-Stabilized Microtubules. *Cytoskeleton*, **70** (2013), pp. 74-84. doi:10.1002/cm.21091

Valdman, David, Paul J. Atzberger, Dezhi Yu, Steve Kuei, and Megan T. Valentine. Spectral Analysis Methods for the Robust Measurement of the Flexural Rigidity of Biopolymers. *Biophysical Journal*, **102** (2012), pp. 1144-1153. doi:10.1016/j.bpj.2012.01.045

# presentations

"High shear microstructure and rheology of rod-like viruses"
Steve Kuei, Paul Salipante, Ryan Murphy, Katie Weigandt, Steven D. Hudson
*American Institute of Chemical Engineers Annual Meeting. Boston, MA, October 2021.*

"High shear capillary rheology and flow birefringence of rod-like viruses"
Steve Kuei, Paul Salipante, Ryan Murphy, Katie Weigandt, Steven D. Hudson
*Society of Rheology Annual Meeting. Bangor, ME, October 2021.*

"High shear rate microstructural and rheological response of rod-like viruses via capillary rheoSANS"
Steve Kuei, Paul Salipante, Ryan Murphy, Katie Weigandt, Steven D. Hudson
*Sigma Xi Postdoctoral Poster Presentation. Virtual, March 2021.*

"High shear rate capillary rheology of rod-like viruses"
Steve Kuei, Paul Salipante, Steven D. Hudson
*American Physical Society Division of Fluid Dynamics Annual Meeting. Virtual, Nov. 2020.*

"Probing the link between the microstructural behavior and bulk response of rod-like viruses at high shear rates via capillary Rheo-SANS"
Steve Kuei, Paul Salipante, Steven D. Hudson
*American Institute of Chemical Engineers Annual Meeting. Virtual, Nov. 2020.*

"Probing the link between the microstructural behavior and bulk response of rod-like viruses at high shear rates via capillary Rheo-SANS"
Steve Kuei, Steven D. Hudson
*Selected talk at Gordon Research Seminar, and poster at Gordon Research Conference on Colloidal, Macromolecular, and Polyelectrolyte Solutions. Ventura, CA, Feb. 2020.*

"Coiling dynamics of semiflexible chains under rotational fields"
Steve Kuei, Sibani Lisa Biswal
*Society of Rheology Annual Meeting. Raleigh, NC, Oct. 2019.*

"Dynamics of semiflexible paramagnetic colloidal chains under a rotational magnetic field"
Steve Kuei, Sibani Lisa Biswal
*Doctoral Dissertation Defense. Houston, TX, Mar. 2019.*

Poster: "Deterministic and chaotic dynamics of rotating semiflexible particle chains"
Steve Kuei, Sibani Lisa Biswal
*Gordon Research Seminar, Gordon Research Conference on Colloidal, Macromolecular, and Polyelectrolyte Solutions. Ventura, CA, Feb. 2018.*

"From Filaments to Coils: Controlling the Dynamics of Linked Colloidal Particle Chains"
Steve Kuei, Sibani Lisa Biswal
*American Institute of Chemical Engineers Annual Meeting. Minneapolis, MN, Nov. 2017.*

Poster: "Dynamics of Semiflexible Colloidal Particle Chains Under Rotating Magnetic Fields"
Steve Kuei, Sibani Lisa Biswal
*American Institute of Chemical Engineers Annual Meeting. Minneapolis, MN, Nov. 2017.*

**Langmuir Graduate Student Poster Presentation Award**
Poster: "Deterministic and chaotic dynamics of driven colloidal particle chains"
Steve Kuei, Sibani Lisa Biswal
*ACS 91st Colloid & Surface Science Symposium. New York, NY, July 2017.*

"Controlling the dynamics of actuated semi-flexible colloidal particle chains"
Steve Kuei, Sibani Lisa Biswal
*ACS 91st Colloid & Surface Science Symposium. New York, NY, July 2017.*

"Dynamics and Rotational Regimes of Semi-Flexible Colloidal Chains"
Steve Kuei, Sibani Lisa Biswal
*American Institute of Chemical Engineers Annual Meeting. San Francisco, CA, Nov. 2016.*

**Langmuir Graduate Student Poster Presentation Award**
Poster: "Rotational regimes and dynamics of colloidal particle chains"
Steve Kuei, Sibani Lisa Biswal
*ACS 90th Colloid & Surface Science Symposium. Boston, MA, June 2016.*

"Conformations and dynamical regimes of rotating elastic filaments"
Steve Kuei, Sibani Lisa Biswal
*ACS 90th Colloid & Surface Science Symposium. Boston, MA, June 2016.*

Poster: "Dynamics and Conformations of Rotating Semiflexible Particle Chains"
Steve Kuei, Sibani Lisa Biswal
*Gordon Research Seminar, Gordon Research Conference on Colloidal, Macromolecular and Polyelectrolyte Solutions. Ventura, CA, Feb. 2016.*

"Dynamics and Conformations of Semiflexible Particle Chains Driven By Rotating Magnetic Fields"
Steve Kuei, Sibani Lisa Biswal
*American Institute of Chemical Engineers Annual Meeting. Salt Lake City, UT, Nov. 2015.*

"Conformations of semiflexible magnetic chains under rotating magnetic fields"
Steve Kuei, Sibani Lisa Biswal
*ACS 89th Colloid & Surface Science Symposium. Pittsburgh, PA, June 2015.*

"Using simple flows to tie knots in flexible fibers"
Steve Kuei, Chris Sadlej, Howard Stone

*APS 65th Annual Division of Fluids Dynamics Meeting. San Diego, CA, November 2012.*

"Spectral analysis methods for flexural rigidity measurements"
Steve Kuei, Dezhi Yu, Megan Valentine
*RISE Summer Research Colloquium. Santa Barbara, CA, August 2011.*

"Polymer crystallization on curved surfaces"
Steve Kuei, Lynn Loo
*PEI Summer of Learning Symposium. Princeton, NJ, Sept 2010.*

# awards

2018 **NRC Postdoctoral Research Associateship Award** National Research Council
Awarded through a national competition to research scientists and engineers of unusual promise and ability to perform advanced research related to the NIST mission.

2017 **Langmuir Graduate Student Poster Presentation Winner** ACS Colloids 2017
Awarded to the three best poster presentations at the ACS Colloids 2017 meeting.

2016 **Langmuir Graduate Student Poster Presentation Winner** ACS Colloids 2016
Awarded to the five best poster presentations at the ACS Colloids 2016 meeting.

2015 **Riki Kobayashi Fellowship Award** Rice University
Presented for outstanding Ph.D Thesis Proposal entitled: "Dynamics of magnetically actuated colloidal particle chains". Awarded to one thesis proposal in the department per year, by the ChBE Graduate Studies Committee.

2015 **Chemical Engineering Dept. Teaching Assistant Award** Rice University
Awarded to two Teaching Assistants every year, for dedication, patience, and knowledge of course material, as chosen by the Junior Class in Fall 2015 (CHBE 401).

2014 **Chemical Engineering Dept. Teaching Assistant Award** Rice University
Awarded to two Teaching Assistants every year, for dedication, patience, and knowledge of course material, as chosen by the Junior Class in Fall 2014 (CHBE 401).

2013 **Chemical Engineering Dept. Teaching Assistant Award** Rice University
Awarded to two Teaching Assistants every year, for dedication, patience, and knowledge of course material, as chosen by the Senior Class in Fall 2013 (CHBE 443).

2011 **Research Internships in Science and Engineering** UC Santa Barbara
Accepted into undergraduate summer research program with the Materials Research Laboratory at UCSB; advised by Professor Megan Valentine.

2010 **Siebel Energy Grand Challenge Award** Princeton Environmental Institute
Grant awarded to pursue student-initiated summer research, in the Organic and Polymer Electronics Laboratory; advised by Professor Lynn Loo.

# teaching experience

2015 **Dean's Teaching Assistant** Rice University
CHBE 401: Transport Phenomena I - see TA duties below. In addition, in charge of designing curriculum and teaching during main lectures.

2013-2015 **Teaching Assistant** Rice University
CHBE 443: Chemical Engineering Lab II - introduced, supervised, and graded spectroscopy, distillation, heat transfer, and process control labs
CHBE 305: Comp. Methods in Chem. Eng - graded problem sets and exams.
CHBE 401: Transport Phenomena I - in charge of preparing problems and lecturing during recitations each week, as well as leading problem sessions each week and exam review sessions.

2008-present **Private tutoring** East Brunswick, NJ; Princeton, NJ; Houston, TX
Instructed over a dozen students in the areas of algebra/calculus, biology, and chemistry, helping strengthen fundamentals, derivations, and concepts, to help in school and on SATs

2008-2012 **Princeton Juggling** Princeton, NJ
Taught diabolo weekly in public sessions.

2005-2009 **Mid-Jersey Chinese School** East Brunswick, NJ
Taught weekly diabolo classes to 30 students aged 7-18, and also prepared them for performances and state-wide competitions.

# Mentoring

2/2016-8/2016 **Burke Garza** Rice University
Taught and mentored student to fabricate colloidal partical chains, perform experiments using magnetic coils and high speed cameras, and analyze using image processing techniques.

5/2017-3/2018 **Jialing (Caroline) Li** Rice University
Taught and mentored student to fabricate colloidal particle chains and perform experiments studying chaotic filament dynamics.

5/2021-8/2021 **Sareet Nayak** NIST
Intern through NIST's Summer High School Intern Program (SHIP), co-mentored with Dr. Paul Salipante. Taught student basics of fluid mechanics and rheology, aided them with their project using computational fluid mechanics software (openFOAM) to investigate complex fluid flow in slit geometries, and mentored them as they prepared a talk to present their findings at an end-of-program colloquium.

# Professional development

2020 **Illumina Executive Coaching**
Career Coaching program, organized through the NRC postdoctoral program at NIST.

# leadership and activities

2020-2022 **PEAR** executive board
Member of executive board for PEAR, the postdoctoral and early-career researcher association at NIST. In charge of email list, and marketing for events. Planned and run academic and social events.

2016-2017 **Wyldstyl** Dancer
Dancer in Wyldstyl, a competition hiphop dance company based in Soundbox Studios, in Houston TX.

2016-2018 **Gordon Research Seminar: Colloidal, Macromolecular, and Polyelectrolyte Solutions** Co-Chair
In charge of organization, fundraising, and running of Gordon Research Seminar, as well as inviting and organizing speakers from academia, national labs, and industry to present research and mentor students.

2015-2019 **Center for Teaching Excellence Graduate Advisory Board** Graduate Liason, ChBE
Department representative to the Center for Teaching Excellence Advisory Board, which seeks to further teaching excellence at Rice University, by providing workshops and opportunities to train in various classrooms skills, such as oration, curriculum design, etc.

2015-2016 **School Advancement Committee** Graduate Committee member
Department representative for the School Advancement Committee, which is a high-level review of the George R. Brown School of Engineering, to discuss student challenges and current opportunities, as well as new initiatives for the future direction of the school.

2013-2019 **Funkonomics Crew** Artistic Director (2015-2019)
Performing member, in bboy and hip-hop styles; in charge of coordinating, choreographing, and preparing guest performances with various groups around campus and the greater Houston area; choreographed and taught ten performance sets. In charge of teaching twice-weekly hip-hop classes, for which multiple pieces were choreographed or learned elsewhere.

2014-2016 **ChBE Graduate Student Association** Publicity Chair, Vice President
Planned and helped run academic and social events for the ChBE graduate students, such as barbeques, seminars, and receptions; in charge of all marketing and publicity, such as designing posters, t-shirts, and managing social media (publicity chair, 2014-2015). In charge of and co-organizer of the ChBE Graduate Mentor program, a new initiative wherein incoming students are paired with older mentors to help them acclimate to graduate life (Vice President, 2015-2016).

2010-2013 **Triple 8 East Asian Dance Company**
Performing member in various dance styles: hip-hop, martial arts, Chinese traditional, and modern; choreographed and taught two full pieces and several short pieces and workshops.

2008-2012 **Princeton Juggling Club** Co-president
Organized guest performances and logistics for the 2010 annual show, managed club finances and equipment, and managed club website and communications (as co-president, 2009-2010); performed in group shows, and 20+ individual diabolo performances.

2009-2012 **Princeton Taiwanese American Student Association**
Coordinated cultural events, banquets, Asian Night Market (2012 Class Representative, 2010-2011); managed group website and social media (Webmaster, 2011-2012)

2010-2011 **Intercollegiate Taiwanese American Student Association** Marketing Director
Helped plan and run 2011 East Coast ITASA conference with 400+ attendees; created promotional materials and conference materials for all attendees, and managed the event's website and social media outlets.

2008-2012 **Sympoh Urban Arts Dance Crew**
Performing member, in bboy and hip-hop styles; choreographed and taught sections for workshops and auditions; taught beginner workshop series for new members (2009-2012)