

Yu Liu

1200 E. California Blvd, MC 128-95
Pasadena, CA 91125
(626) 376-8650
www.its.caltech.edu/~yul
yul@caltech.edu

EDUCATION California Institute of Technology, Ph.D. in physical chemistry, 2010 (GPA 4.1/4.3)
University of Science and Technology of China, B.S. in chemical physics, 2003 (GPA 4.0/4.0)

EXPERIENCE

Postdoctoral Scholar Laboratory of Interfacial & Small Scale Transport
Division of Engineering and Applied Science
California Institute of Technology
(2009–Present)

- *In situ* observation of self-organization of polymer nanofilms under temperature gradient.
- Investigation of the driving mechanism of the pattern formation process in nanofilms.

Graduate Research Assistant Collier Research Group
Division of Chemistry and Chemical Engineering
California Institute of Technology
(2003–2009)

- Design and construction of microfluidic devices for the generation and manipulation of femtoliter water-in-oil droplets.
- Design and construction of femtoliter chamber array for single-molecule enzymology.
- Stochastic simulation of chemical reaction networks close to bifurcation.
- Emergent behavior of molecular network under spatial confinement.

Teaching Assistant

- Introduction to Micro/Nanofabrication Lab (Fall, 2006; Winter, 2007 and Spring, 2007).
- General Chemistry (Fall 2003).
- Fundamental Techniques of Experimental Chemistry (Winter, 2004 and Spring, 2004).
- Introduction to Biophysical Chemistry (Winter, 2005; Spring, 2005; Winter, 2006 and Spring, 2006).
- The Physical Description of Chemical Systems (Fall, 2006 and Fall, 2007).

Undergraduate Research Assistant The State Key Laboratory of Molecular Reaction Dynamics
Institute of Chemistry
Chinese Academy of Sciences
(2002–2003)

- Stochastic quantum reaction dynamics in dissipative systems.

SKILLS

Experimental

- Generation and manipulation of surfactant-stabilized femtoliter droplet reactors using microfluidic devices.
- Fabrication of multi-layer microfluidic devices using soft lithography.
- Confocal and wide-field fluorescence microscopy.
- Photon counting using APD or PMT.
- Micro/nanofabrication: optical lithography, metal deposition, lift-off and etc.

- Motion control with piezoelectric device or stepper motor.
- Essential molecular biology techniques.
- Surface characterization by profilometer and atomic force microscope.
- Interfacial tension measurement using axisymmetric drop shape analysis.
- Scanning electron microscopy and E-beam lithography.
- Matlab scripting for data analysis and instrument control.
- Instrument control by LabVIEW.
- Single-molecule manipulation with optical tweezer.
- Preparation of giant and small unilamellar vesicles and reconstitution of supported lipid bilayers.
- Operation of various analytical instruments: UV/Vis spectrometer, fluorometer, stopped-flow workstation, dynamic light scattering and etc.
- CAD design with AutoCAD and DesignCAD.
- Unix shell scripting for text and image processing.

Theoretical and Computational

- Finite element analysis of multiphysics problems using COMSOL.
- Fluid physics in low Reynolds number regime (laminar flow).
- Scientific computation using C/C++ and Mathematica.
- Matlab scripting for numerical computation.
- Stochastic simulation of biochemical reaction networks with or without spatial resolution.
- Simulation of microscopic systems using quantum mechanics or molecular dynamics.

Miscellaneous

- Training in machine shop and electronic shop.
- Scientific typesetting using L^AT_EX.
- Linux system administration.

GRADUATE COURSES

- The Physics of Fluids. Instructor: Troian. Grade: A.
- Atomic Level Simulations of Materials and Molecules. Instructor: Goddard. Grade: A+.
- Methods of Computational Science and Engineering. Instructor: Djorgovski. Grade: P (P/F only).
- Physical Biology of the Cell. Instructor: Phillips. Grade: A+.
- Biological Physics Laboratory. Instructor: Phillips. Grade: A.
- Methods in Modern Microscopy. Instructor: Fraser. Grade: A.
- Introduction to the Micro/Nanofabrication Lab. Instructor: Quake. Grade: P (P/F only).
- Mathematical Methods of Physics. Instructor: Schwarz. Grade: A.
- The Elements of Quantum Chemistry. Instructor: Kuppermann. Grade: A+.
- Introduction to Biochemistry. Instructors: Richards and Campbell. Grade: A.

HONOR

Guo Moruo Scholarship, University of Science and Technology of China (2003)

PUBLICATIONS

- McLeod, E., Liu, Y., & Troian, S. M. Experimental Confirmation of Thermocapillary Effect in 3D Structuring of Polymer Nanofilms. *To be submitted*.
- Liu, Y., Jung, S.Y. & Collier, C.P. Shear-Driven Redistribution of Surfactant Affects Enzyme Activity in Well-Mixed Femtoliter Droplets. *Analytical Chemistry* **81**, 4922–4928 (2009).
- Jung, S.Y.* , Liu, Y.* & Collier, C.P. Fast Mixing and Reaction Initiation Control of Single-enzyme Kinetics in Confined Volumes. *Langmuir* **24**, 4439–4442 (2008).¹
- Yan, Y.A., Yang, F., Liu, Y. & Shao, J.S. Hierarchical Approach Based on Stochastic Decoupling to Dissipative Systems. *Chemical Physics Letters* **395**, 216–221 (2004).

¹*: Authors with equal contribution