

Simou Sun, Ph. D.

Assistant Professor

Department of Chemistry
Stony Brook University
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EDUCATION

The Pennsylvania State University, University Park

Ph.D., Chemistry

January 2019

Advisor: Professor Paul S. Cremer

Dissertation: Sensing and Characterizing Interactions with Lipid Membranes

Shandong University, Shandong, P. R. China

B. S., Chemistry

June 2013

Mentor: Professor Yanzhao Yang

Thesis: Synthesis and Catalytic Studies of Copper-Doped Ceria Loaded with Gold Nanoparticles

RESEARCH AREAS

Physical chemistry, biophysics, bioanalytics, and biomaterials

APPOINTMENTS

Assistant Professor

September 2024 - present

Department of Chemistry

Stony Brook University

Research projects:

- *Emergent behaviors at biomembranes localized in the interphase boundary;*
- *Extracellular vesicles and nanoparticles (EVPs)-based grammar in noncontact intercellular communications and disease progression;*
- *Environmental information encoded in the physicochemical and biochemical properties of sea spray aerosols.*

Research Fellow

November 2021 – August 2024

Institute for Digital Molecular Analytics and Science (IDMxS)

Nanyang Technological University, Singapore

Supervisor(s): Professor Jay T. Groves

Professor Atul N. Parikh

Research projects:

- *Mapping digital fingerprints from individual extracellular vesicles by high-throughput imaging and deep-profiling of particle content;*

- *Exploring the interplay between 2D-phase separation of bacterial effector proteins and the physico-chemical properties of plant membranes;*
- *Developing biosensing assays leveraging on tunable interactions between soft matter and colloidal particles.*

Visiting Scholar

April 2021 – August 2021

Multiscale Research Institute for Complex System

Fudan University, P. R. China

Host: Professor Zhongwen Chen

Research projects:

- *Characterizing the interactions between SARS-CoV-2 spike protein and ACE2 at an engineered live cell - model lipid membrane interface.*

Postdoc Scholar

February 2019 – December 2020

California Institute for Quantitative Biosciences (QB3)

University of California, Berkeley

Advisor: Professor Jay T. Groves

Research projects:

- *Elucidating the phase transition mechanism of the LAT:Grb2:SOS signaling hub on T cell plasma membranes;*
- *Deciphering the phosphorylation-dependent signaling kinetics of tyrosine kinase ZAP70 in the T cell receptor signaling pathway.*

**Leave of absence from December 2020 due to pandemic related travel restrictions

Graduate Research Assistant

December 2013 – January 2019

The Pennsylvania State University, University Park

Advisor: Professor Paul S. Cremer

Research projects:

- *Building membrane-based biosensing assays with pH-sensitive fluorescence probes;*
- *Investigating the molecular-level interactions between phospholipids and small molecule drugs, antimicrobial peptides and viral proteins using vibrational sum frequency generation spectroscopy (VSFGS);*
- *Understanding the mechanism of interleaflet component translocation in lipid membranes by establishing a bilayer decoupling assay.*

Undergraduate Research Intern

May 2010 – June 2013

Shandong University, Shandong, P. R. China

Mentor: Professor Yanzhao Yang

Research projects:

- *Synthesis and characterizations of ceria-based nanostructured materials.*

HONORS AND AWARDS

Nanyang Presidential Postdoctoral Fellow, Finalist, Nanyang Technological University	2022
Dalalian Research Fellowship, Penn State University	2018
Second prize oral presentation at the Biomembrane Symposium, ACS Spring National Meeting	2018
Excellent New Graduate Student Fellowship, Penn State University	2013
Outstanding Undergraduate Thesis of Shandong University	2013

PUBLICATIONS

Citations: 432

h-index: 9

†co-first authors

Non-refereed Journal Articles:

Sun, S. †; Gai, E. †; Lew, L. J. N.; Kim, N.; Huang, W. Y. C.; Groves, J. T. Deciphering the Phosphorylation-Dependent Signaling Kinetics of Zap70. **Ready for submission.**

Liu, C. †; **Sun, S.** †; Yang, T.; Cremer, P. S. Tuning the Interaction Energies between Lipid Head Groups and Planar Substrates. **In preparation.**

Refereed Journal Articles:

Zhu, X.; Wang, W.; **Sun, S.**; Chng, C.-P.; Xie, Y.; Zhu, K.; He, D.; Liang, Q.; Wu, X.; Gao, W.; Miserez, A.; Yu, J.; Huang, C.; Groves, J. T.; Miao, Y. Bacterial XopR Subverts RIN4 Complex-mediated Plant Immunity via Plasma Membrane-associated Percolation. **In revision with Cell Host & Microbe.**

Sun, S.; Cox-Vázquez, S. J.; Cho, N.-J. Bazan, G. C.; Groves, J. T. Direct Imaging with Multidimensional Labeling and High-Content Analysis Allows Quantitative Categorization and Characterizations of Individual Small Extracellular Vesicles and Nanoparticles (sEVs). **Journal of Extracellular Vesicles. Accepted.**

Sun, S.; GrandPre, T.; Limmer, D. T.; Groves, J. T. Kinetic Frustration by Limited Bond Availability Controls the LAT Protein Condensation Phase Transition on Membranes. **Sci. Adv.** 2022, 8, eabo5295.

Poyton, M. F.; Pullanchery, S.; **Sun, S.**; Kusler, K.; Yang, T.; Gagliardi, L.; Cremer, P. S. Zn²⁺ Binds to Phosphatidylserine and Induces Membrane Blebbing. **J. Am. Chem. Soc.** 2020, 142, 43, 18679–18686. ***Highlighted as a JACS Spotlights:** <https://pubs.acs.org/doi/10.1021/jacs.0c11041>

Sun, S.; Liu, C.; Melendez, D. R.; Yang, T.; Cremer, P. S. Immobilization of Phosphatidylinositides Revealed by Bilayer Leaflet Decoupling. **J. Am. Chem. Soc.** 2020, 142, 30, 13003-13010.

Sun, S.; Sendekci, A.; Pullanchery, S.; Huang, D.; Yang, T.; Cremer, P. S. Multi-Step Interactions between Ibuprofen and Lipid Membranes. **Langmuir**, 2018, 34, 10782-10792.

Bilkova, E.†; Pleskot, R.†; Rissanen, S.†; **Sun, S.**†; Czogalla, A.; Cwiklik, L.; Rog, T.; Vattulainen, L.; Cremer, P. S.; Jungwirth, P.; Coskun, Ü. Calcium Directly Regulates Phosphatidylinositol 4,5-Bisphosphate Headgroup Conformation and Recognition. **J. Am. Chem. Soc.** 2017, 139, 4019-4024.

Shengjuler, D.; Chan, Y. M.; **Sun, S.**; Moustafa, I. M.; Li, Z.; Gohara, D. W.; Buck, M.; Cremer, P. S.; Boehr, D. D.; Cameron, C. E. The RNA-Binding Site of Poliovirus 3C Protein Doubles as a Phosphoinositide-Binding Domain. **Structure** 2017, 25, 1875-1886.

Shengjuler, D.; **Sun, S.**; Cremer, P. S.; Cameron, C. E. PIP-on-a-Chip: A Label-Free Study of Protein-Phosphoinositide Interactions. *JoVE* 2017, 125, e55869.

Robison, A. D.; **Sun, S.**; Poyton, M. F.; Johnson, G. A.; Pellois, J.; Jungwirth, P.; Vazdar, M.; Cremer, P. S. Polyarginine Interacts More Strongly and Cooperatively with Supported Lipid Bilayers Compared to Polylysine. *J. Phys. Chem. B* 2016, 120, 9287-9296.

Sun, S.; Zhao, X.; Lu, H.; Zhang, Z.; Wei, J.; Yang, Y. Unusual Properties of Nanostructured $Ce_{1-x}Co_xO_{2-y}$, $Ce_{1-x}Ni_xO_{2-y}$ and $Ce_{1-(x+y)}Co_xNi_yO_{2-z}$: Structural Studies and Catalytic Activity. *CrystEngComm*. 2013, 15, 1370-1376.

Wang, S.; Yang, H.; Feng, L.; **Sun, S.**; Guo, J.; Yang, Y.; Wei, H. A Simple and Inexpensive Synthesis Route for $LiFePO_4/C$ Nanoparticles by Co-Precipitation. *J. Power Sources*. 2013, 233, 43-46.

Wei, J.; Wang, S.; **Sun, S.**; Yang, Z.; Yang, Y. Formation of Catalytically Active CeO_2 Hollow Nanoparticles Guided by Oriented Attachment, *Materials Letters* 2012, 84, 77-80.

Book Chapters:

Yeager, C.; Shengjuler, D.; **Sun, S.**; Cremer, P.S.; Cameron, C.E. (2021). Characterization of Protein-Phospholipid/Membrane Interactions Using a "Membrane-on-a-Chip" Microfluidic System. In: Botelho, R.J. (eds) *Phosphoinositides. Methods in Molecular Biology*, vol 2251. Humana, New York, NY.

Lee, J.; Marianelli, A. M.; **Sun, S.**; Parikh, A.; Keating, C. D. (2024). Encapsulation of Liquid-Liquid Phase Separation Within Giant Lipid Vesicles. In: Dimova, R & Marques, C. (eds) *The Giant Vesicle Book. In progress*.

PATENTS

Sun, S.; Bazan, G. C.; Groves, J. T. Quantitative Categorization and Characterizations of Individual Small Extracellular Vesicles and Nanoparticles (sEVPs) Using Direct Imaging with Multidimensional Labeling and High-Content Analysis. *Provisional patent filed (no. 10202400399P)*.

RESEARCH GRANTS

Contributions to Prior Funded Research:

Investigating the Interactions of Ions with Polypeptides 2014 – 2017
Principal Investigator: Prof. Paul S. Cremer
National Science Foundation
Role: **Co-author**

Building a Multicolor pH Modulation Sensing Platform for Time Resolved and Multistep Sensing 2016 - 2017
Principal Investigator: Prof. Paul S. Cremer
ONR Defense University Research Instrumentation Program (DURIP)
Role: **Co-author**

TEACHING RECORD

- Instructor**, Stony Brook University 2024 – present
Course: Molecular Structure and Spectroscopy Lab (Chem357)
- Teaching Assistant**, The Pennsylvania State University 2013 – 2015
Course: General Chemistry Lab (Chem111)

AFFILIATIONS AND SERVICE

- Journal referee** 2018 – present
Journal of the American Chemical Society Langmuir
ACS Applied Materials and Interfaces Biophysical Journal
Accounts of Chemical Research The Journal of Physical Chemistry Letters
- Member** 2018 – present
American Chemical Society
Biophysical Society
- Volunteer** 2022 - present
Promotion of Women in Engineering, Research and Science (POWERS)
Nanyang Technological University
- Co-chair** 2023
Platform: Enzyme Function, Cofactors, and Post-Translational Modifications
Biophysical Society 67th Annual Meeting
- Initiator and organizer** 2023
IDMxS Postdoc Seminar Series
- Discussion leader** 2022
Biointerface Science Gordon Research Conference
- Science mentor** 2018
STEM Extension Weekend of the Penn State University MRSEC Summer Academy Program
- Team leader** 2017
“Paper Microfluidics” Project
Penn State University MRSEC Summer Academy Program

PRESENTATIONS

Oral

Sun, S. “Characterizing the regulatory roles of biomembranes in two-dimensional protein condensation phase transitions.” ACS National Meeting, New Orleans, March 2024.

Sun, S. "Deciphering the phosphorylation-dependent signaling kinetics of Zap70". Biophysical Society 67th Annual Meeting, San Diego, February 2023.

Sun, S. "Controlling the location of membrane components in planar supported bilayers." ACS National Meeting, New Orleans, March 2018.

Sun, S. "Probing ion and small molecule drug interactions with lipid membranes." Middle Atlantic Regional Meeting (MARM) of the ACS, Hershey, June 2017.

Poster

Sun, S. "High-throughput quantitative mapping of digital fingerprints from individual exosomes." Gordon Research Conference on Chemical Imaging, Easton, July 2023.

Sun, S. "Kinetic frustration by limited bond availability controls the LAT protein condensation phase transition on membranes." Gordon Research Conference on Biointerface Science, Lucca, Italy, June 2022.

Sun, S. "Kinetics of the LAT: Grb2: SOS Protein Condensation Phase Transition on Membranes Resemble a Glass Transition." BPS National Meeting, Virtual, February 2021.

Sun, S. "Multi-step interactions between ibuprofen and lipid membranes probed by pH modulation sensing and spectroscopy." Gordon Research Seminar on Bioanalytical Science, Rhode Island, June 2015.