Hanquan (Han) Su

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Professional Experience

Postdoctoral Fellow with Professor Peng Yin — Boston, MA
Wyss Institute and Department of Systems Biology, Harvard University — *12/2020 - present*

Postdoctoral Fellow with Professor Khalid Salaita — Atlanta, GA
Chemistry Department, Emory University — *9/2020 - 11/2020*

Education

Emory University — Atlanta, GA
Ph.D. in Chemistry — *9/2014 - 8/2020*

Dissertation title: Development of methods for mechanical manipulation of biomolecules and super-resolution measurement of cellular forces

Advisor: Professor Khalid Salaita

Research Topic:

- Developed single-molecule based super-resolution imaging methods to map integrin mediated force with sub-50 nm resolution.
- Developed light-responsive polymer particles as force clamps for parallelized mechanical unfolding of biomolecules.
- Investigated parallelized single-molecule mechanical unfolding using time-resolved fluorescence spectroscopy.

University of Science and Technology of China — Anhui, China
B.S. in Chemistry — *9/2010 - 6/2014*

Undergraduate research advisor: Professor Weixin Huang

Research Topic:

- Synthesized and studied noble metal-metal oxide catalysts for low temperature activation and oxidative coupling of methane.

Awards and Honors

1. Student Travel Award — 2019
   Biophysical Society (BPS)
   - Award to young biophysicist to attend the annual BPS meeting
2. Quayle Student Achievement Award — 2019
   Department of Chemistry, Emory University
   - Department award to students who have demonstrated excellent research accomplishment
3. Chinese Undergraduate Visiting Research (UGVR) Program — 2013
   School of Engineering, Stanford University
   - Participants among junior students from top Chinese universities are funded by Stanford University to conduct REU research project in the School of Engineering

4. Outstanding Student Scholarship 2011 - 2013
   University of Science and Technology of China
5. University-level outstanding students 2012
   University of Science and Technology of China
6. Outstanding Freshmen Scholarship 2010
   University of Science and Technology of China

PEER-REVIEWED PUBLICATIONS (* = EQUAL CONTRIBUTION)

1. Brockman, J.;* **Su, H.**;* Blanchard, A.; Duan, Y.; Meyer, T.; Quach, E.; Glazier, R.; Bazrafshan, A.; Ma, R.; Schueder, F.; Petrich, B.; Jungmann, R.; Li, R.; Mattheyses, A.; Ke, Y.; Salaita, K.; "Live-cell super-resolved PAINT imaging of pN cellular traction forces", *Nature Methods* **2020**, just accepted.
2. Ramey, A.; **Su, H.**; Salaita, K.; "Mechanical Stimulation of Adhesion Receptors Using Light-Responsive Nanoparticle Actuators Enhances Myogenesis", *ACS Applied Materials and Interfaces* **2020**, DOI:10.1021/acsami.0c08871.
3. Deal, B.; Ma, R.; Ma, V. P.-Y.; **Su, H.**; Kindt, J.; Salaita, K.; "Engineering DNA-Functionalized Nanostructures to Bind Nucleic Acid Targets Heteromultivalently with Enhanced Avidity", *Journal of the American Chemical Society* **2020**, DOI:10.1021/jacs.0c01568
4. Bazrafshan, A.; Meyer, T.; **Su, H.**; Brockman, J.; Blanchard, A.; Piranej, S.; Ke, Y.; Salaita, K.; "Tunable DNA Origami Motors Translocate Ballistically Over m Distances at nm/s Speeds", *Angewandte Chemie International Edition* **2020**, 59, 2–10, DOI:10.1002/anie.201916281
   - Highlighted by *Nature*: "DNA racers burn up the track in molecular Grand Prix." *Nature* **2020**. (https://www.nature.com/articles/d41586-020-00394-w)
   - See report on Emory News explaining the work: Clark, C., "New DNA motor breaks speed record for nano machines". (https://news.emory.edu/features/2020/03/esc-dna-origami-motor/index.html)
   - Highlighted by *Advanced Science News*: Corless, V., "New DNA origami motor breaks speed record for nano machines" (https://www.advancedsciencenews.com/new-dna-origami-motor-breaks-speed-record-for-nano-machines/)
   - Highlighted by *ScienceDaily*: "New DNA origami motor breaks speed record for nano machines" (https://www.sciencedaily.com/releases/2020/03/200303140149.html)
   - Highlighted by *EurekAlert!*: "New DNA origami motor breaks speed record for nano machines" (https://www.eurekalert.org/pub_releases/2020-03/ehs-ndo030320.php)
5. Merg, A.; van Genderen, E.; Bazrafshan, A.; **Su, H.**; Zuo, X.; Touponse, G.; Blum, T.; Salaita, K.; Abrahams, J.; Conticello, V. "Seeded Heteroepitaxial Growth of Crystallizable Collagen Triple Helices: Engineering Multifunctional 2D Core-Shell Nanostructures", *Journal of the American Chemical Society* **2019** 141, 51, 20107-20117, DOI:10.1021/jacs.9b09335.
6. Ma, R.; Kellner, A.V.; Ma, V. P.-Y.; **Su, H.**; Deal, B. R.; Brockman, J. M.; Salaita, K.; "DNA probes that store mechanical information reveal transient piconewton forces applied by T cells", *Proceedings of the National Academy of Sciences* **2019**,116, 34, 16949-16954, DOI:10.1073/pnas.1904034116.
   - Highlighted by *Nature Immunology*: Fehervari, Z., "Brief forces measure up." *Nature Immunology* **2019**, 20, 1260, DOI:10.1038/s41590-019-0509-8

- See report on Emory News explaining the work: Clark, C., "DNA 'origami' takes flight in emerging field of nano machines", (https://esciencecommons.blogspot.com/2019/09/dna-origami-takes-flight-in-emerging.html)

7. Zhao, J.; **Su, H.**; Vansuch, G.; Liu, Z.; Salaita, K; Dyer, R. B.; "Localized Nanoscale Heating Leads to Ultrafast Hydrogel Volume-Phase Transition", *ACS Nano* **2019**, 13, 1, 515-525, DOI:10.1021/acsnano.8b07150
8. Galior, K.; Ma, V. P.-Y.; Liu, Y.; **Su, H.**; Baker, N.; Panettieri, R. Jr.; Wongtrakool, C.; Salaita, K.; "Molecular Tension Probes to Investigate the Mechanopharmacology of Single Cells: A Step Towards Personalized Mechano-medicine", *Advanced Healthcare Materials*. **2018**, 7, 1800069, DOI:10.1002/adhm.201800069.
9. **Su, H.**;* Liu, Z.;* Liu, Y.; Ma, V. P.-Y.; Blanchard, A.; Zhao, J.; Galior, K.; Dyer, R. B.; Salaita, K.; "Nanoparticle force-clamp for optically controlled mechanical unfolding of DNA", *Nano Letters* **2018**, 18, 4, 2630-2636, DOI:10.1021/acs.nanolett.8b00459.
10. Ma, V. P.-Y.; Liu, Y.; Blanchfield, L.; **Su, H.**; Evavold, B. D.; Salaita, K.; "Ratiometric tension probes for mapping receptor forces and clustering at intermembrane junctions", *Nano Letters* **2016**, 16, 7, 4552-4559, DOI:10.1021/acs.nanolett.6b01817.

Manuscripts in Preparation (* = equal contribution)

1. **Su, H.**;* Brockman, J.;* Duan, Y.;* Sen, N.; Chhabra, H.; Bazrafshan, A.; Blanchard, A.; Andrew, B.; Meyer, T.; Doye, J.; Ke, Y.; Brian, R.B.; Salaita, K.; "Massively parallelized origami-polymer force clamp for time-resolved mechanical unfolding of ensembles of molecules", manuscript in preparation.
2. **Su, H.**; Salaita, K.; "Massively parallelized mechanical manipulation of single molecules to enable chemical analysis of force spectroscopy", manuscript in preparation.
3. Blanchard, A.; J. Comb, D.; Brockman, J.; Kellner, A.; Glazier, R.; **Su, H.**; Bazrafshan, A.; Bender, R.; Chen, W.; Quach, E.; Li, R.; Matteyses A.; Salaita, K.; "Turn-key super-resolution mapping of cell receptor force orientation and magnitude using a commercial structured illumination microscope", under review.

Presentations

1. "Polymer foce clamps for the mechanical unfolding of target molecules."
   64th BPS Annual Meeting, San Diego, CA, USA, February 18, **2020**. (Oral Presentation)
2. "Light-Responsive Polymer Particles as Force Clamps for the Mechanical Unfolding of biomolecules"
   63rd BPS Annual Meeting, Baltimore, MD, USA, March 2, **2019**. (Poster)
3. "Light-Responsive Polymer Particles as Force Clamps for the Mechanical Unfolding of biomolecules"
   The 10th Biennial Single Molecule Biophysics Conference, Aspen Center for Physics, CO, USA, January 6-11, **2019**. (Poster)
4. "Light-Responsive Polymer Particles as Force Clamps for the Mechanical Unfolding of Target Molecules" The 11th Southeast Meeting on Soft Materials, Emory University, GA, USA, May 23, **2018**. (Poster)
5. "Light-Responsive Polymer Particles as Force Clamps for the Mechanical Unfolding of Target Molecules" Greater Atlanta Chemical Biology Symposium (GACBS) 2018 Program, GA, USA, April 21, **2018**. (Poster)

6. Nanoparticles for mechanical unfolding of biomolecules “Molecular Assembly and Function” Mini-Conference, Emory University, GA, USA, June 2, **2017**. (Oral Presentation)
7. “Dynamic Materials for Synthetic Muscle and Optomechanics” “Molecular Assembly and Function” Mini-Conference, Emory University, GA, USA, June 2, **2017**. (Poster)
8. “Nanoscale optomechanical actuators for controlling mechanotransduction in living cells” The 11th annual Emerson Center Lectureship Award Symposium, Emory University, GA, USA, October 5, **2015**. (Poster)

Teaching Experience

1. Analytical Chemistry Lab (CHEM 260L) Teaching Assistant — Spring 2017
   Emory University, Atlanta, GA
2. General Chemistry Lab (CHEM 142) Teaching Assistant — Spring 2015
   Emory University, Atlanta, GA
3. General Chemistry Lab (CHEM 142) Teaching Assistant — Fall 2014
   Emory University, Atlanta, GA

Outreach Activities

1. ""“Distance Matters: Weirdness at the Nanoscale." — 5/2019
   Emory University
   - Presented interactive scientific demo to local high school students as a part of the 1st annual “Emory Access to Success (EASE)” program.
2. “Thinking big with small scales” — 3/2016
   Centennial Olympic Park, Atlanta
   - Designed and showed interactive demo to the public attendees at the booth of Atlanta Science Festival Expo.