SIYU HE

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Education

2018.09 – present MS leading to PhD program, Columbia University, NY, USA

2013.09 – 2018.06 B.S. in Physics, Honor Science Program, Xian Jiaotong University, Xi'an, China

Research Experience

2018.09 – present, Research Assistant in Biomedical Engineering, Columbia University

• **Advisors:** Dr. Kam Leong & Dr. Elham Azizi

• **Topic:** Deep learning based morphological and transcriptome analysis of tissue engineered organoids

∗ Applying deep-learning techniques to investigate vasculopathy in tissue-engineered vessel organoids derived from patients with genetic disorders.

∗ Modeling the radiation injury and countermeasure drug efficacy on blood vessel organoids.

∗ Studying the motility and morphological patterns of engineered mesenchymal stem cells spheroids.

∗ Deep learning of the spatial transcriptomics and understanding the spatial pattern in the midbrain organoids

∗ Modeling Proteus syndrome by iPSC-derived vascular organoids

2017.02 – 2018.01 Research Assistant in Molecular and Cellular Biology at Harvard University

• **Advisors:** Dr. Howard Berg

• **Topic:** Mechanosensing in the bacterial flagellar motor of E.coli

∗ Studied the mechanism of load-dependence of bacterial flagellar motor assembly by changing the mechanical stimuli from electrorotation.

∗ Created a mathematical algorithm to analyze the rotation frequency of flagellar motor to study the load-dependent mechanism of the stators in the motor; combined wavelet transform and images analysis to increase the resolution of frequency tendency.

2016.09 – 2016.12 Research Assistant in Physics of Living Systems at Massachusetts Institute of Technology

• **Advisors:** Dr. Nikta Fakhri

• **Topic:** Non-equilibrium physics in living systems

∗ Diagnosed broken detailed balance by a wavelet transform method in starfish oocyte cells probed with short fluorescent single-walled carbon nanotubes.

∗ Applied wavelet transformation to track small single-walled carbon nanotubes as probes.

2015.09 – 2016.01 Research Assistant in Physics at Texas A& M University

• **Advisors:** Dr. Marlan Scull

• **Topic:** Investigation of Chocolate Bloom & TERS imaging of aptamers for non-label DNA sequencing

2015.05 – 2015.08 REU student in Physics at University of Notre Dame

• **Advisors:** Dr. Timothy C. Beers

• **Topic:** Bi-modality of Carbon Enhance Metal Poor Stars

Research Interests

- Tissue engineering, Stem cell engineering, Organoids, Gene editing, Disease modeling, Drug testing,
- Deep learning, Single cell sequencing, Spatial transcriptomics, Imaging processing

Publications

- **He S***, Xu, C*, Chauhan S, Lao YH, Xiao Y, Willner M, McElroy S, Tomer R, Jin Y, Rao S, Gogos J, Azizi E, Xu B, Leong K. Mapping morphological malformation to genetic dysfunction in blood vessel organoids. Under submission (2021).
- **He S***, Lao YH*, Azizi E, Leong K. MSC-cancer interaction induced topological defect correlate with cancer cell apoptosis. In preparation (2021).
- Kim, H.S., Xiao, Y., Chen, X., **He S**, Im, J., Willner, M.J., Finlayson, M.O., Xu, C., Zhu, H., Choi, S.J. and Mosharov, E.V., 2021. Chronic opioid treatment arrests neurodevelopment and alters synaptic activity in human midbrain organoids. bioRxiv.
- G Zhong*, J Wang*, **He S*** and X Fu*. (2021) Towards better understanding of developmental disorders from integration of spatial single-cell transcriptomics and epigenomics. ICML Workshop in Computational Biology 2021.

- R. Kunes, **He S**, Y. Xiao, S. Tavare, D. Knowles. (2020) Supervised Tumor Cell Subtype Identification via SCAN. ICML Workshop in Computational Biology 2020.
- Lee J. H., Chen Z., **He S**, Zhou J., Tsai A., Truskey G., & Leong K. W. Emulating Early Atherosclerosis in a Vascular Microphysiological System Using Branched Tissue-Engineered Blood Vessels. Advanced Biology, 2000428.
- Heuler J, **He S**, Ambardar S, Voronine DV. Point-of-care detection, characterization, and removal of chocolate bloom using a handheld Raman spectrometer. Scientific reports. 2020 Jun 17;10(1):1-0.
- Mintz RL, Lao YH, Chi CW, **He S**, Li M, Quek CH, Shao D, Chen B, Han J, Wang S, Leong KW. CRISPR/Cas9-mediated mutagenesis to validate the synergy between PARP1 inhibition and chemotherapy in BRCA1-mutated breast cancer cells. Bioengineering & translational medicine. 2020 Jan;5(1):e10152.
- **He S***, Li H, Gomes CL, Voronine DV. Tip-enhanced Raman scattering of DNA aptamers for Listeria monocytogenes. Biointerphases. 2018 Jun 3;13(3):03C402.
- Yoon J, Beers TC, Placco VM, Rasmussen KC, Carollo D, **He S**, Hansen TT, Roederer IU, Zeanah J. VizieR Online Data Catalog: Carbon-enhanced metal-poor (CEMP) star abundances (Yoon+, 2016). VizieR Online Data Catalog. 2017 Mar;183.
- Li H, Zhao S, Xia M, **He S**, Yang Q, Yan Y, Zhao H. Spontaneous formation of non-uniform double helices for elastic rods under torsion. Physics Letters A. 2017 Feb 19;381(7):689-700.
- Yoon J, Beers TC, Placco VM, Rasmussen KC, Carollo D, **He S**, Hansen TT, Roederer IU, Zeanah J. Observational Constraints on First-star Nucleosynthesis. I. Evidence for Multiple Progenitors of CEMP-No Stars. The Astrophysical Journal. 2016 Dec 5;833(1):20.

Research Skills

- **Experimental Skills**: cell culture, stem cell engineering, gene editing, tissue engineering, lentiviral transduction, confocal microscope, single-cell analysis, AFM-Raman joint system (for TERS), AFM, confocal Raman spectroscope, DNA origami; bacteria culture, microfluidics.
- **Programming and Software**: Pytorch, Tensorflow, Pyro, paraView, Openfoam, Comsol, Matlab, C++, C, LaTeX, Origin, Python, R

Selected Honors and Awards

- ICML2021 Workshop on Computational Biology Fellowship 2021
- Sigma Xi Grants-in-Aid of Research Award 2021
- First Prize in Mount Everest Scholarship (One of six students awarded, Xian Jiaotong University) 2015,2016
- Siyuan Scholarship, Xian Jiaotong University 2014, 2015,2016
- Dean' s List Award, Xian Jiaotong University 2014
- Second Prize,China Undergraduate Physics Tournament (Chinese Physical Society) 2014

Presentations

- Poster, BMES2021
- Poster, iCML2021 compbio workshop
- Poster, iCML2020 compbio workshop
- Poster, SEAS PhD Research Symposium, Columbia 2019.09
- Oral, Joint Meeting of the Texas Section of the AAPT, APS and the Society of Physics Students 2015.10

Academic Activities

- Internship at Roche,Data Scientist: emerging technologies in cell rna sequencing 2021.06–2021.08
- Mentor at Bioforce program 2021.07–2021.08
- Judging in ENVISION & Women in STEM 2020.12 – 2021.01
- Teaching Assistant on BMEN 4530 DRUG AND GENE DELIVERY, Columbia University 2019.09–2019.12
- XJTU Representative at China Undergraduate Physics Tournament, awarded Second Prize 2016.08
- Honor Science Program (Physics), selected on basis of outstanding performance in physics 2013–2018

Other Activities

- Member of council in XJTU Alumni Association of Greater New York Nov. 2020 - Present
- Scientific American, Intern Apr. 2017 - Dec. 2017
- Volunteer,35th Council Meeting of Association of Asia Pacific Physical Societies Apr. 2017
- Compere of graduation ceremony of College of Tsien Hsue-shen June 2017
- Public Activities Organizer for Bulletin Board System of XJTU May 2017-June 2017