

ZHOUYI HE

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Leibniz Institute for Polymer Research, Hohe Str. 6, 01069 Dresden, Germany

EDUCATION

Leibniz Institute for Polymer Research (IPFDD) Doctor of Philosophy in Physics (Theoretical Biophysics)	<i>03/2023 - 03/2026</i> <i>Ongoing</i>
Supervisor: Prof. Jens-Uwe Sommer and Dr. Tyler Harmon	
PhD Project: Theory and simulation of biomolecular condensates	
Hong Kong University of Science and Technology (HKUST) Master of Philosophy in Chemistry (Chemical Physics)	<i>08/2019 - 06/2022</i> GPA: 3.33/4.3
Supervisor: Prof. Haibin Su	
MPhil Thesis: Statistical Methods for Protein Function and Evolution Analysis	
University of Science and Technology of China (USTC) Bachelor of Science in Chemistry (Chemical Physics)	<i>08/2015 - 06/2019</i> GPA: 3.23/4.3
Supervisor: Prof. Xiao Zheng	
BSc Thesis: Discussion on the Unit Cell Consistency of Maximally Localized Wannier Function	
TOEFL:107 (Reading:30, Listening:30, Speaking:22, Writing:25)	<i>09/2022</i>

PUBLICATIONS AND CONFERENCES

Connecting protein architecture to their emergent droplet properties, Biological physics session, the 87th Annual Conference of the DPG Spring Meeting of the Condensed Matter Section

*Xiaolong Yang, **Zhouyi He**, and Xiao Zheng. "Unit cell consistency of maximally localized Wannier functions." Electronic Structure 2.1 (2020): 014001.*

*Muhammad Hasan, **Zhouyi He**, et al. "Dynamic Expedition of Leading Mutations in SARS-CoV-2 Spike Glycoproteins." bioRxiv. (Preprint, under review)*

Impact of mutations in CRISPR Cas9 in kinetics and off-targets effects, The 1st International Symposium on Marine Science and Engineering for Young Scientists and Postgraduates

RESEARCH EXPERIENCE

Connecting protein architecture to their emergent droplet properties Ph.D
Prof. Jens-Uwe Sommer, Dr. Tyler Harmon, Institute Theory of Polymers, IPFDD *03/2023 - now*

• We employed coarse-grained simulations to investigate how structural modularity of a specific model system impacts the phase diagram and material properties of these droplets. Our research yields insights into the phase behavior of biomolecular condensates and provides guidelines for the modulation of droplet material properties.

Co-translational condensation of polyribosome and protein Ph.D
Prof. Jens-Uwe Sommer, Dr. Tyler Harmon, Institute Theory of Polymers, IPFDD *12/2023 - now*

• We hypothesize that during translation peptide chains attached to mRNA can already induce polyribosome-protein condensation. Our coarse-grained simulations illustrated how this process occurs and the impact of protein domain organization. Currently, we are collaborating with experimentalists for validation. This study aims to uncover the role of phase separation in the process of translation.

Sequence-dependent target search and binding dynamics of CRISPR Cas9 M.Phil
Prof. Haibin Su, department of chemistry, HKUST 01/2021 - 03/2022

- Target search dynamics of CRISPR Cas9, is modelled by facilitated diffusion, namely the combination of 3D diffusion and 1D sliding. This work fills the gap of Cas9 target search dynamics and aim to further understand the binding free energy landscape of other DNA-targeting proteins.
- With bioinformatics analysis, we develop a kinetic model link the protein mutation and Cas9 target binding discrimination. This study enhances our understanding of Cas9 binding dynamics, guiding the design of Cas9 variants for minimizing off-target rates.

Dynamic Expedition of Leading Mutations in SARS-CoV-2 Spike Glycoproteins M.Phil
Prof. Haibin Su, department of chemistry, HKUST 05/2021 - 01/2022

- We developed deLemus, a time-resolved statistical method, to analyze spike protein evolution dynamics. By quantifying single amino-acid polymorphisms, we reveal mutation patterns, assess amino acid mutation strength, and efficiently detect emergent variants for spike-targeting vaccine design.

Evolution of CRISPR Cas9 systems in Streptococcus Genus M.Phil
Prof. Haibin Su, department of chemistry, HKUST 06/2020 - 05/2021

- We employed statistical coupling analysis to identify evolutionary sectors in 3-D structures. Investigating bacterial-viral interactions via both CRISPR system and Horizontal Gene Transfer reveals a trade-off between HGT benefits and bacterial defense levels.

Unit Cell Consistency of Maximally Localized Wannier Functions Undergraduate Thesis
Prof. Xiao Zheng, department of chemical physics, USTC 09/2018 - 07/2019

- This study focuses on the UCC of MLWFs, crucial for solid-state characterization. We analytically and numerically explore UCC, introducing a symmetry constraint on unitary transformation matrices for rigor. Our findings guide the reliable application of MLWFs in diverse solid-state systems.

Physicochemical and Aggregation Properties of Alpha-synuclein Research Assistant
Prof. Jingqing Huang, department of chemistry, HKUST 07/2018 - 08/2018

- Structural characterization and physicochemical properties of single-molecule alpha-synuclein using Optical Tweezers and Ramon Spectroscopy.

AWARDS

Postgraduate Full Scholarship @HKUST	2019 - 2022
Outstanding Graduate and Graduation Thesis @USTC	2019
Winner of School of Science Summer Research Camp @HKUST	2018
National Endeavor Scholarship @USTC	2016, 2018
Valedictorian of Changsha City Experimental High School	2015
Second Prize in 28th China High School Chemistry Olympic Competition	2014
Third Prize in Hunan Province High School Mathematics Olympic Competition	2014

LEADERSHIP AND OUTREACH

Teaching Assistant of <i>Soft Condensed Matter Theory</i> @ Technische Universität Dresden	2023
Teaching Assistant of <i>Physical Chemistry</i> @HKUST	2022
Teaching Assistant of <i>Mathematical Methods for Physical Chemistry</i> @HKUST	2020, 2021
Winner of Excursion Photography Competition by International Office @ TUD	2024
Church Youth Group Leader @CBIBC & Dresden Chinese Christian Fellowship	2019 - now
Captain of university hiking team and basketball association @USTC&@HKUST	2015 -2021
Volunteer of in 30th China High School Chemistry Olympic Competition @USTC	2015
Leader of the supportive teaching team in rural area @Western Hunan, China	2015