

HAO SHEN

shenh2@uw.edu

EDUCATION

University of Washington, Seattle 2014 - 2019

- Ph.D. in Molecular Engineering
- Thesis: De Novo Design of Self-assembling Helical Protein Filaments
- Supervisor: David Baker, Professor of Biochemistry, Institute for Protein Design, HHMI Investigator

Tsinghua University, Beijing 2010 - 2014

- B.S. in Biological Science

University of Washington, Seattle Fall 2012

- International Exchange Program with full scholarship

RESEARCH EXPERIENCE

Senior Fellow, Institute for Protein Design, University of Washington, Seattle 2019 - Present

- Computational designed pH-responsive, peptide-induced, multi-component, chlorophyll dependent, far-red fluorescent filament and nucleation dependent large filaments with long persistent length and strength, as well as conductive protein nanowire and functional protein nanomaterials
- Fluorescent microscopy characterization of protein filament dynamics

PhD Student, Prof. David Baker's group, University of Washington, Seattle 2014 - 2019

- Developed computational method and designed de novo self-assembling helical protein filaments
- Expressed, purified, and performed negative stain electron microscopy (EM) screening
- Prepared CryoEM sample, collected data and perform helical structure reconstruction
- Performed light scattering and participated in fluorescence measurement to assess filament kinetics

Research Assistant, Prof. Haipeng Gong's group, Tsinghua University, Beijing 2013 - 2014

- Observed structural transition of LacY transporter using molecular dynamics simulation
- Developed a differentiable statistical hydrogen bonding energy based on PDB structures

Research Assistant, Prof. Nir Ben-Tal's group, Tel Aviv University, Israel Summer 2013

- Improved ConSurf, a quality assessment method for protein model-structure, by fold subdivision

Research Assistant, Prof. Haiteng Deng's group, Tsinghua University, Beijing 2011 - 2012

- Studied the regulatory function of a growth factor that can induce bone regeneration
- Cloned, expressed, purified and used HPLC-MS to identify protein from cell culture

Intern, Beijing ACCB Biotech Ltd., Beijing Summer 2012

- Performed real-time fluorescent PCR for cancer gene expression to develop personalized diagnosis

PUBLICATIONS & PATENTS

- Nucleation limited assembly and polarized growth of a de novo-designed allosterically modulatable protein filament. **Shen H** et al., bioRxiv. doi: <https://doi.org/10.1101/2024.09.20.613980> (2024)
- De novo design of multi-component self-assembling helical filaments. **Shen H** et al., (In preparation)
- De novo design of pH-responsive self-assembling helical protein filaments. **Shen H**, Lynch EM, Akkineni S, et al. *Nature Nanotechnology* (2024)
- Time-tagged ticker tapes for intracellular recordings. Lin D, Li X, Moulton E, Park P, Tang B, **Shen H**, et al., *Nature Biotechnology* (2023)
- Alignment of Au nanorods along de novo designed protein nanofibers studied with automated image analysis. Yaman MY, Guye KN, Ziatdinov, **Shen H**, et al., *Soft Matter* 17 (25), 6109-6115 (2021)
- Importance of Substrate-Particle Repulsion for Protein-Templated Assembly of Metal Nanoparticles. Guye KN, **Shen H** et al., *Langmuir* 37 (30), 9111-9119 (2021)
- 1st inventor for US Patent App. 17/285,057, 2021 Entitled: Self-Assembling Protein Homo-Polymers
- Development of a dual-functional conjugate of antigenic peptide and Fc-III mimetics (DCAF) for

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targeted antibody blocking. Zhang L, **Shen H**, et al., *Chemical Science* 10, 3271-3280 (2019)

- De novo design of self-assembling helical protein filaments. **Shen H**, Fallas JA, Lynch E, et al., *Science* 362, 705–709 (2018)

HONORS & AWARDS

- Protein Science Travel Awards (2019)
- Schultz Travel Fellowship from UW Biochemistry (2017)
- First Prize Scholarship for Comprehensive Performance (2011-2013)
- Honors Program of Life Sciences (2011)

LEADERSHIP & SERVICE

- Mentor for rotation student, Jorge Cardenas, University of Washington, Spring (2021)
- Mentor for visiting graduate student, Miaomiao Xu, University of Washington (2019)
- Organizer for Women in Science lunch, University of Washington (2019)
- Mentor for summer research student, Yan Li, University of Washington (2016)
- Mentor for summer research student, Can Li, University of Washington (2015)
- Co-founder of the 1st acappella group to reach Tsinghua University singing competition finals (2013)
- Assistant to the President, Students' Sci.& Tech. Association, Tsinghua University (2011)
- Teaching Assistant for English Summer Camp, Tsinghua University (2011)

PRESENTATIONS

Invited Presentations

- “De Novo Design of Self-assembling Helical Protein Filaments” Center for Soft Matter Science and Engineering, Peking University, China (2019)
- “De Novo Design of Self-assembling Helical Protein Filaments” School of Mathematics, Renmin University of China (2019)

Contributed Conference Presentations

- “De novo design of pH-responsive self-assembling helical protein filaments” Center for the Science of Synthesis Across Scales Annual Meeting, Seattle WA (2023)
- “De Novo Design of Self-assembling Helical Protein Filaments” RosettaCON 2018, Leavenworth, WA (2018)

Poster Presentations

- “De Novo Design of Self-assembling Helical Protein Filaments” Tsinghua-*Science* Symposium on Novel Proteins and Structures, Beijing, China (2019)
- “De Novo Design of Self-assembling Helical Protein Filaments” Protein Society 33rd Annual Symposium, Seattle WA (2019)
- “Computational Design of Self-assembling Protein Fibers” Self-Assembly & Supramolecular Chemistry Gordon Research Conference, Les Diablerets, Switzerland (2017)

SKILLS & LANGUAGES

- Protein structure modeling and design, molecular cloning, protein biochemistry, CryoEM, light scattering, fluorescence microscopy, yeast genetics and culture
- Programming experience: Rosetta, Python, Perl, C++, Bash, Pascal
- Fluent in Mandarin, Cantonese, and English
- Simultaneous Interpretation program certificated by Transmax (Chinese and English)