

ZHENGQING ZHOU

Department of Biomedical Engineering, Duke University, NC, USA
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EDUCATION

Peking University

Bachelor of Science, Physics

Beijing, China
Sep 2017 – Jul 2021

University of California, Los Angeles

Exchange student at the Physics and Astronomy Department

CA, USA
Sep 2019 – Dec 2019

PUBLICATIONS

Zhou, Z. *et al.* Dynamics of SARS-CoV-2 and Host Immunity in Infection and Vaccine Protection. Under review at *Nat. Commun.* DOI: 10.21203/rs.3.rs-590500/v1

RESEARCH EXPERIENCE

Plasmids by the Numbers

Advisor: Prof. Lingchong You, Department of Biomedical Engineering

Duke University
Sep 2021 – Feb 2022

- Constructed an online database for plasmid dynamics in microbial community. (www.plasmidsbynumbers.com/)
- Collected ~800 entries of qualitative (e.g. antibiotic resistance) and quantitative data (e.g. transfer rate) of over 140 plasmids.

Niche Partitioning Shapes Plasmid Dynamics

Advisor: Prof. Lingchong You, Department of Biomedical Engineering

Duke University
Sep 2021 – Feb 2022

- Niche partitioning decouples interspecific interactions and shapes the interaction matrix into a partitioned one.
- Nutrient niche partitioning retains the conjugation matrix dense, while spatial niches partition the matrix.
- Fundamental difference between the interaction matrix and conjugation matrix shape leads to increased conjugation frequency, suggesting diverse nutrient supply increases plasmid abundance.

Dynamics of SARS-CoV-2 Infection and Host Immunity and Vaccine Protection

Advisor: Prof. Fangting Li, School of Physics, Center for Quantitative Biology

Peking University
Feb 2020 - Present

- Improved upon previous viral infection models by including the full immune system dynamics of innate, cellular and humoral immune cells, cytokines and antibodies.
- Derived a collective metric (immune efficacy) of innate and adaptive immune cells to quantify the strength of dynamic immune response and analyzed COVID-19 patients' clinical data to confirm the metric.
- Collaborated with Wuhan Union Hospital and the CoronaVac team to analyze vaccination data and used immune efficacy to mechanistically predict vaccine protection rate with higher accuracy than previous works.
- Manuscript currently under review at *Nature Communications*.

Nonlinear Dynamics in Robust Yeast Cell Cycle

Advisor: Prof. Fangting Li, School of Physics, Center for Quantitative Biology

Peking University
Oct 2018 – June 2021

- Investigated all possible three-node network topologies and kinetic parameters for robust cell cycle.
- Discovered a $-1/2$ scaling law between S phase duration and key cyclin Clb5 caused by critical slowing down, which renders robustness to cell cycle.
- Constructed an experimental yeast strain allowing for dynamic control over Clb5 expression and visualization and timing of spindle organization.

TECHNICAL SKILLS

Programming

- Python, MATLAB, HTML, MySQL, Flask

Experiments

- Molecular biology experiments; Microbe growth and conjugation experiments.

TEACHING AND OUTREACH EXPERIENCE

- Biophysics modeling of cell cycle. Biophysics Seminar, Peking University Aug 2020
- Reverse engineer the dynamics in biology. Physics Frontiers Seminar Series, Peking University May 2019

SELECTED AWARDS AND HONORS

- Honorable Mention Award in ICM Contest in Modeling 2021
- Outstanding Award, Challenge Cup academic contest, Peking University 2020
- Beijing Innovation Research Training Fellowship 2020
- Wanglaoji Overseas Exchange Scholarship 2019
- Outstanding Research Award, Peking University 2018