Dingwen Qian

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SUMMARY

A theoretical physicist with primary interests in non-equilibrium and transport phenomena in soft matter systems. Works closely with experimentalists on water-purification, charge transport in confined systems and self-assembly processes. The primary computational tools involved in the research are Molecular Dynamics and Monte Carlo simulations. Builds simple phenomenological models to bridge simulations and experiments.

EDUCATION BACKGROUND

Northwestern University　　　　　　　　　　　　　　　　　　　　　**Evanston, IL**
Ph.D. in Applied Physics　　　　　　　　　　　　　　　　　　　*Candidate, Jun. 2024*
Dissertation: "Self-assembly and transport in chemical and physical networks"
Advisor: Prof. Monica Olvera de la Cruz

Fudan University　　　　　　　　　　　　　　　　　　　　　　　**Shanghai, China**
B.S. in Physics　　　　　　　　　　　　　　　　　　　　　　　　　　*Jun. 2018*

RESEARCH EXPERIENCE

Northwestern University　　　　　　　　　　　　　　　　　　　　　**Evanston, IL**
Doctoral Researcher, Prof. Monica Olvera de la Cruz's Laboratory　　　*Sep. 2018-Present*

- Elucidated the nucleation mechanisms of hydrogen-bonded organic nanotubes using graph theory and kinetic Monte Carlo simulations.
- Found soliton-like excitations in the transport of size- and charge-asymmetric colloidal mixtures using Brownian Dynamics simulations.
- Unravalled the entropic origin of the size-selective adsorption of dye molecules to covalent organic framework membranes using all-atomistic molecular dynamics.
- Constructed a coarse-grained model for ionic transport in polyelectrolyte gel, decoupling the effect of charge fraction and porosity.

Fudan University　　　　　　　　　　　　　　　　　　　　　　　**Shanghai, China**
Undergraduate Research Assistant, Prof. Donglai Feng Laboratory　　　*Sep. 2016-June. 2018*

- Constructed an in-situ mutual inductance measurement apparatus that were integrated into a scanning probe microscopic system.
- Utilized scanning transmission microscopy (STM) for characterization of the surface properties of two-dimensional superconducting films.

University of California, Berkeley　　　　　　　　　　　　　　　**Berkeley, China**
Undergraduate Research Assistant, Prof. Feng Wang Laboratory　　　　*Sep. 2017-Dec. 2017*

- Utilized atomic force microscopy to characterize morphology of carbon nanotubes for building magnetic sensors based on the Aharonov–Bohm effect.

PUBLICATIONS

- Sayantan Mahapatra*, **Dingwen Qian***, Ruihua Zhang, Shuliang Yang, Penghao Li, Yuanning Feng, Long Zhang, Huang Wu, James S. W. Seale, Partha Jyoti Das, Prateek K. Jha, Kevin Lee Kohlstedt, Monica Olvera de la Cruz & Fraser Stoddart. Realization of hydrogen-bonded fibers assembled from trigonal prismatic building blocks (*under review*, * These authors contributed equally)
    - Constructed a phenomenological model of the self-assembly process of hydrogen-bonded organic nanotubes using graph representations. Used Kinetic Monte Carlo model to unravel the competition between different pathways of nucleation and growth.
- **Dingwen Qian** & Monica Olvera de la Cruz (2023). Field-driven cluster formation in two-dimensional colloidal binary mixtures. Phys. Rev. E 107, 044605
    - Discovered active clustering of colloidal particles along with soliton-like vibrational motion of the lattice in field-driven superionic colloidal crystals through Brownian Dynamics simulations.
- Julie L. Fenton*, David Burke*, **Dingwen Qian**, Monica Olvera de la Cruz, & William R. Dichtel (2021). Polycrystalline Covalent Organic Framework Films Act as Adsorbents, Not Membranes. J. Am. Chem. Soc. 2021, 143, 3, 1466–1473 (* These authors contributed equally)
    - Revealed the entropic origin of the size-dependent adsorption of dye molecules to Covalent Organic Framework membranes using umbrella sampling in all-atom Molecular Dynamics simulations.

CONFERENCE PRESENTATIONS

- **Dingwen Qian**, Sayantan Mahapatra, Fraser Stoddart, &Monica Olvera de la Cruz (2024). Hydrogen-bonded organic nanotube: origin of anisotropy in the growth kinetics. Poster at Gordon Research Conference 2024, Molecular and Ionic Clusters
- **Dingwen Qian** & Monica Olvera de la Cruz (2022). Field driven pattern formation in 2D colloidal systems. March meeting 2022-American Physical Society

Service

- Discussion leader. Gordon Research Seminar 2024, Molecular and Ionic Clusters

AWARDS & ACHIEVEMENTS

- Center for Computation and Theory of Soft Materials fellow, Northwestern University   *2020-2023*
- Walter P. Murphy Graduate Fellowship, Northwestern University   *2018*
- First Tier Student Scholarship, Fudan University   *2016*
- Second Tier Student Scholarship, Fudan University   *2015*

TEACHING EXPERIENCE

Northwestern University   **Evanston, IL**
Teaching assistant, Quantum Mechanics   *Jan. 2023-Apr. 2023*

- Led discussion sessions every week for improving students' problem solving skills. Constructed illustrative questions and provided detailed solutions for students using LaTeX.
- Had effective interactions with students on course contents and homework problems during office hours.

SKILLS

- Analytic and numerical calculations using Mathematica and Matlab.
- Customizing Monte Carlo simulations using C++ and python.
- Multi-scale molecular dynamics. Experienced on GROMACS package for all-atomistic molecular dynamics simulations and LAMMPS package for coarse-grained molecular dynamics simulations.
- Data processing using python.