

# CHANGYUAN WANG

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## EDUCATION

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### University of California, Santa Barbara

Sept. 2019 - Present

Honors Bachelor of Science, Major in Physics, Minor in Mathematics

GPA: 3.97/4.00

## RESEARCH EXPERIENCES

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### Experimental Soft Matter Group

Aug. 2021 - Present

*PI: Prof. Zvonimir Dogic, Co-Mentor: Raymond Adkins*

*UCSB*

- Worked on self-assembled colloidal phage membranes and their development and variations.
- *End labeling*: Worked out a highly efficient phage & end label combination among various phage systems; implemented labeled phages to induce shape changes on colloidal membranes, and analyzed why it is analogous to specific dynamics among lipid bilayers.
- *Crosslinking*: ① Crosslinked colloidal membranes with 2-arm PEG; explored the extreme salt concentration gradient that crosslinked vesicles could endure while retaining their shapes; ② Discovered unexpected pore formation dynamics of uncrosslinked vesicles under osmotic pressure
- *Genetic engineering*: ① Genetically modified phage lengths to attain dissimilar colloidal rods, incorporate them into phage monolayers, and studied membrane distortions; ② Transformed versatile end proteins and antibiotic resistance sequences between phages to obtain more functional species.

### Directed Reading on Differential Geometry

Mar. 2022 - Jun. 2022

*Supervisor: Prof. Xianzhe Dai, Co-Mentor: Danning Lu*

*UCSB*

- Went through the Ph.D. thesis of Leroy Jia, a mathematician collaborator of Dogic Lab; derived several toy models of pore formations on vesicles based on Jia's equations of colloidal membranes.
- Used MeshLab to help analyze and present pore formation models to Prof. Xianzhe Dai during biweekly meetings.

### Experimental Nanophotonic Materials Group

Apr. 2021 - Aug. 2021

*PI: Prof. Siying Peng*

*Westlake University*

- Solely worked on simulating the monolayer perovskite excitons coupled to a nontrivial photonic crystal by Lumerical FDTD; collaborated with experimentalists to search for practical choices of perovskite and parameters of photonic crystals.
- Used tight-binding approximation to predict perovskite-photonic crystal system.

## AWARDS AND FELLOWSHIPS

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### Worster Summer Research Fellowship

UCSB, 2022

*Project: Developing Phages with a Versatile End-Label toward a Model System for Endocytosis*

## TECHNICAL SKILLS

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### Languages

MATLAB, Python, Mathematica, R

### Hardware

Raspberry Pi, LabJack U3-HV

### Scientific Software

COMSOL, Ansys Lumerical FDTD, Inkscape

## SELECTED COURSEWORK

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**Graduate Classes:**

Quantum Mechanics, Complex Fluids, Biomaterials and Biosurfaces, Symmetry and Tensor Properties of Materials, Mechanical Behavior of Materials

**Undergraduate Elective Classes:**

Condensed Matter, Complex Analysis, Topology, Differential Geometry, Linear Algebra, Group Theory, Teaching Physics

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**TEACHING EXPERIENCES****Learning Assistant**

*Hold three weekly discussion sections and two office hours. Involves answering questions about homework and section worksheets, promoting classroom discussions, and presenting examples to explain concepts.*

- PHYS 119A, Thermodynamics and Statistical Mechanics, with Prof. Philip Pincus Fall 2021

**Grader**

*Wrote half of solutions of weekly problem sets and graded them.*

- PHYS 103, Intermediate Mechanics, with Prof. Kai Kristiansen Summer 2021
- PHYS 20, General Physics, with Prof. Cenke Xu Fall 2020

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**PROJECT GALLERY****Term Paper: Colloidal Phage Membranes as a Model System for Lipid Bilayer Dynamics**

*Prof. Angela A. Pitenis*

*Spring 2022*

- Mock review paper
- Introduced colloidal membranes self-assembled from filamentous bacteriophages; analyzed why they can serve as a model system of biological membrane dynamics; presented evidence in shape transitions, splitting and merging events, pore formation, and membrane-membrane interactions.

**Term Paper: Model Membrane Systems for 2D Monolayer Membrane Coalescence and 3D Bilayer Membrane Fusion**

*Prof. Daniel S. Gianola*

*Winter 2022*

- Mock review paper
- Introduced GUVs, SUVs (giant/small unilamellar vesicles,) and colloidal phage monolayers as model systems for the dynamics of membrane fusion; identified their limitations and possible improvements

**Term Project: Fiber Optical Gyroscope**

*Supervisor: Prof. Andrew Jayich, Collaborators: Yuan Li, Haopu Yang*

*Spring 2021*

- Built a fiber optical gyroscope, collected light intensity changes by LabJack, implemented USB virtualization to remotely send data to laptops, and used the Sagnac effect to convert shifted fringes into angular velocities.
- In charge of most material selection, purchase, and testing; light path setup, stabilization, and calibration; USB virtualization; data analysis
- Solely organized all data and created a GitHub repository [GitHub]

**Term Paper: The Application of Fourier Transform in Speech Recognition Systems**

*Prof. Jean M. Carlson*

*Winter 2021*

- Analyzed how Fourier Transforms are applied in Speech Recognition Systems, especially how to decompose vocal information to distinguish different persons' voices, extract emotional states, and recognize numerous languages.