

# Cuncheng Zhu

email: [cuzhu@ucsd.edu](mailto:cuzhu@ucsd.edu)  
url: [cunchengzhu.github.io](https://cunchengzhu.github.io)  
 [CunchengZhu](#)  
 [0000-0003-1373-3492](#)

 [ivFg5KoAAAAJ](#)  
 [github.com/CunchengZhu](https://github.com/CunchengZhu)

## Fields of Interests

mechanics, discrete differential geometry, active matter, scientific computing

## Education

- 2025  
(expected) **PhD in Engineering Science with specialization in Computational Science**  
*Department of Mechanical and Aerospace Engineering*  
UNIVERSITY OF CALIFORNIA SAN DIEGO  
Advisors: [David Saintillan](#) and [Albert Chern](#)
- 2022 **MSc in Engineering Physics**  
*Department of Mechanical and Aerospace Engineering*  
UNIVERSITY OF CALIFORNIA SAN DIEGO
- 2019 **BSc in Mechanical Engineering**  
*Department of Mechanical and Aerospace Engineering*  
UNIVERSITY OF CALIFORNIA SAN DIEGO

## Honors & Awards

- 2025 Invited Participant, Geometric Mechanics Formulations for Continuum Mechanics. *Banff International Research Station (BIRS)*.
- 2022 Cover Feature of the Biophysical Reports, Volume 2, Issue 3. [url](#).
- 2022 GEMINI Fellowship Award Honorable Nominee, *Institute of Engineering in Medicine, UCSD*.
- 2019 California Research Assistant (Cal RA) Fellowship, *Graduate admission, UCSD*.
- 2019 UCSD SHORE Recipient, *Graduate admission, UCSD*.
- 2019 UCSD Marshall College Honors Program, *Undergraduate graduation, UCSD*.
- 2015-2019 Provost Honors (8 quarters), *Undergraduate distinctions, UCSD*.

## Publications

### Peer-reviewed

- 2025 C. Z., David Saintillan, Albert Chern. “Active nematic fluids on Riemannian 2-manifolds”. *Proceedings of the Royal Society A* (to appear). [Preprint](#).
- 2025 C. Z., David Saintillan, Albert Chern. “Stokes flow of an evolving fluid film with arbitrary shape and topology”. *Journal of Fluid Mechanics*. [Preprint](#).
- 2024 Jacquelin M Griswold, Mayte Bonilla-Quintana, Renee Pepper, Christopher T Lee, Sumana Raychaudhuri, Siyi Ma, Quan Gan, Sarah Syed, C. Z., Miriam Bell, Mitsuo Suga, Yuuki Yamaguchi, Ronan Chereau, Valentin Nagerl, Graham William Knott, Padmini Rangamani, Shigeki Watanabe. “Membrane mechanics dictate axonal morphology and function”. *Nature Neuroscience* (2024).
- 2023 Hideki Nakamura, Elmer Rho, Christopher T Lee, Kie Itoh, Daqi Deng, Satoshi Watanabe, Shiva Razavi, Hideaki T Matsubayashi, C. Z., Eleanor Jung, Padmini Rangamani, Shigeki Watanabe, Takanari Inoue. “ActuAtoR, a Listeria-inspired molecular tool for physical manipulation of intracellular organizations through de novo actin polymerization”. *Cell Reports* (2023).
- 2022 C. Z., Christopher T. Lee, Padmini Rangamani. “Mem3DG: modeling membrane mechanochemical dynamics in 3D using discrete differential geometry.” *Biophysical Reports*, solicited by the editor-in-chief for submission and featured as the cover of the September 14, 2022 issue. [Preprint](#).

### In preparation

- C. Z., Hang Yin, Albert Chern. “Navier-Stokes vortex formulation on Riemannian manifolds of arbitrary topology”. *In Preparation*.
- C. Z., Albert Chern, David Saintillan. “Defect dynamics on evolving surfaces”. *In Preparation*.
- Arthur Hernandez, C. Z., Luca Giomi. “Geometry and activity control of defects on meta-shells”. *In Preparation*.
- Sreejith Santhosh, C. Z., Albert Chern, David Saintillan, Mattia Serra. “Coherent structures in active flows on curved deformable surfaces”. *In Preparation*.

## Presentations

### Invited Talks

- 2025 “Modeling viscous force on curved surfaces using vorticity-streamfunction formulation”. *5-Day Workshop at Banff International Research Station: Geometric Mechanics Formulations for Continuum Mechanics*. Banff.
- 2025 “Viscous flow of evolving film with arbitrary shape and topology”. *SIAM Conference on Computational Science and Engineering*. Fort Worth.
- 2024 “Active nematics on deformable surfaces”. *L. Mahadevan research group, Harvard University*.

Cambridge.

2024 “Active nematics on deformable surfaces”. *Luca Giomi research group, Universiteit Leiden, Leiden.*

2022 “Mem3DG: Modeling Membrane Mechanochemical Dynamics in 3D using Discrete Differential Geometry”. *Allen Institute for Cell Science. Virtual meeting.*

### Contributed Talks

2024 “Viscous flow of evolving film with arbitrary shape and topology”. *APS Division of Fluid Dynamics 77th Annual Meeting, Salt Lake City.*

2024 “Viscous flow of evolving film with arbitrary shape and topology”. *The 16th World Congress on Computational Mechanics (WCCM)/ 4th Pan American Congress on Computational Mechanics (PANACM), Vancouver.*

2024 “Active nematic fluids on Riemannian 2-manifolds”. *SOCAMS (Southern California Applied Mathematics Symposium) 2024, San Diego.*

2024 “Viscous flow of evolving film with arbitrary shape and topology”. *SoCal Fluids (Southern California Flow Physics Symposium) XVII 2024, Irvine.*

2023 “Dynamics of active nematic fluids on arbitrary manifolds: exploring the role of geometry and topology”. *APS Division of Fluid Dynamics 76th Annual Meeting, Washington DC.*

2023 “Hydrodynamics of active nematics on curved and deformable surface”. *SoCal Fluids (Southern California Flow Physics Symposium) XVI 2023, San Diego.*

### Posters

2023 “Dynamics of active nematic fluids on arbitrary manifolds: exploring the role of geometry and topology”. *Mechanics of Life workshop at the Center for Computational Biology, Flatiron Institute, New York.*

2022 “Mem3DG: Modeling Membrane Mechanochemical Dynamics in 3D using Discrete Differential Geometry”. *Research Expo 2022, Jacobs School of Engineering, UCSD, San Diego.*

2022 “Mem3DG: modeling membrane mechanochemical dynamics in 3D using discrete differential geometry”. *Biophysical Society 2022, San Francisco.*

2021 “Modeling Membrane Dynamics in 3D using Discrete Differential Geometry”. *Biophysical Society 2021, Virtual meeting.*

### Visiting positions

#### 2024 Visiting Scholar

*Luca Giomi research group*

UNIVERSITEIT LEIDEN

Collaborate with Arthur Hernandez and Luca Giomi, providing numerical support for a research project.

## Press coverage

2022 “From the animation industry to membrane biophysics”. *Biophysical Society*. [url](#).

## Service

2023 Session chair, Biofluids: Collective Behavior and Active Matter V. *APS Division of Fluid Dynamics 76th Annual Meeting*. Washington DC.  
2024 Co-Reviewer, *Proceedings of the Royal Society A*.

## Memberships

American Physical Society (APS) Society for Industrial and Applied Mathematics (SIAM)  
Association for Computing Machinery (ACM SIGGRAPH) Biophysical Society (BPS)

## Mentoring & Teaching

### Mentoring

2024-present Leo Serbinov (undergraduate), On computational techniques and theoretical foundations of active nematics on curved surfaces.  
2022 Nandana Madhukara, Eleanor Jung (high school students), On biophysical applications using Mem3DG.  
2019-2020 A group of undergraduate students, On coursework management and graduate school applications. *UCSD JSOE IDEA JUMP program*.

### Teaching Assistant

FA2024 CSE 270 - discrete differential geometry. *UCSD*. (50 students)  
SP2024 MAE 101B - fluid mechanics II. *UCSD*. (100 students)  
FA2023 MAE 210A - fluid mechanics I. *UCSD*. (50 students)  
SP2023 MAE 101B - fluid mechanics II. *UCSD*. (50 students)

### Reader

MAE 8 (WI2023, *UCSD*), MAE 209 (WI2022, *UCSD*), MAE 11 (WI2021, *UCSD*).

## Tutor

2018-2019 [UCSD MAE Math Open House](#). Coordinated bi-weekly walk-in sessions in which over 20 undergraduate students in the MAE department got help on mathematics or related coursework.

## Software

- 2022-2024 [Evolving Stokes Flow](#). An implementation of evolving Stokes flow simulation in MATLAB.
- 2022-2024 [Riemannian Active Nematics](#). An implementation of active nematics simulation in Houdini.
- 2020-2022 [Mem3DG: Modeling Membrane Mechanochemical Dynamics in 3D using Discrete Differential Geometry](#). A flexible software package to model biological membrane and its dynamics using unstructured meshes.
- 2020 [Geometry Central Utilities for Eigen Interoperability](#). The utility functions that map a homogenous POD type to `Eigen::Matrix`.
- 2019 [MuroDrone Localization using Virtual Reality Set](#). An Arduino implementation for a custom circuit board that detects infrared signals to output localization coordinates for a drone.

## Skills

**Languages:** English, Mandarin, Hakka

**Programming Languages:** MATLAB, Python, C++

**Software:** Houdini FX, COMSOL, FEniCS, Adobe Illustrator

**Tools:** Git,  $\LaTeX$ , CMake, Bash