

Chantal Nguyen

BioFrontiers Institute

University of Colorado Boulder

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EDUCATION

University of California, Santa Barbara (UCSB)

2013–2019

Ph.D., Physics

Advisor: Jean M. Carlson

Dissertation: Multiscale network characterization of the strength and resilience of trabecular bone

M.A., Physics, 2016

California State University, Los Angeles (CSULA)

2008–2013

B.S. *magna cum laude*, Physics, 2013

RESEARCH

Postdoctoral Associate, BioFrontiers Institute, University of Colorado Boulder

2019–

Advisor: Orit Peleg

Emergent collective locomotion in worm blobs:

- Developed experimentally-driven active polymer model of collective worm behavior
- Demonstrated that emergent locomotion of worm blobs arises from balancing a tradeoff between attractive forces and self-propulsion strength

Distinguishability and evolution of firefly flash signals:

- Developed “vocabulary generator” model to simulate co-evolution of periodic firefly flash patterns by optimizing for distinguishability and low predation risk

Cost-benefit tradeoffs and information flow in networks of interacting plants:

- Measuring growth and behavior of touch-responsive *Mimosa pudica* under controlled environmental conditions to inform model of spatiotemporal integration and memory of mechanical signals in plants
- Developing experimentally-driven computational model of light-mediated interactions and self-organized growth of sunflowers

Graduate Student Researcher, Department of Physics, UCSB
Advisor: Jean M. Carlson

2015–2019

Novel insights into strength and health of trabecular bone:

- Developed novel network-based method of modeling trabecular bone (a tissue resembling a web of connected struts) for efficient, direct comparison of mechanics and architecture
- Simulated fracture with finite element analysis on beam-based structures representing 3-D realizations of bone networks; identified relationships between network topology and mechanisms of crack propagation
- Validated novel magnetic resonance (MR) technique for probing fine tissue structure; determined predictive marker of bone health from simulated MR measurements

Data-driven modeling of decision making in natural disaster evacuation:

- Developed stochastic models of collective human decision making in evacuation scenarios, driven by data from a behavioral experiment
- Characterized decision making under social influence and group vote

Optimal vaccine allocation during an infectious disease outbreak:

- Developed a stochastic form of the susceptible-infected-recovered (SIR) model to simulate infectious disease epidemics occurring in two interacting communities
- Identified optimal vaccination strategies given level of interaction between communities, and time delay between outbreak and vaccine deployment

JOURNAL PUBLICATIONS

- C. Nguyen***, Y. Ozkan-Aydin*, H. Tuazon, D. I. Goldman, M. S. Bhamla, O. Peleg. (2021) Emergent collective locomotion in an active polymer model of entangled worm blobs. *Frontiers in Physics* 9:734499. *denotes equal contribution
- C. Nguyen**, D. Peetz, A. E. Elbanna, and J. M. Carlson. (2019) Characterization of fracture in topology-optimized bioinspired networks. *Physical Review E* 100(4): 042402.
- A. Mondal, **C. Nguyen**, X. Ma, A. E. Elbanna, and J. M. Carlson. (2019) Network-based models for characterization of trabecular bone. *Physical Review E* 99(4): 042406.
- C. Nguyen**, K. J. Schlesinger, F. Han, I. Gür, and J. M. Carlson. (2018) Modeling individual and group evacuation decisions during wildfires. *Fire Technology* 55(2): 517.
- C. Nguyen**, K. J. Schlesinger, T. W. James, K. M. James, R. L. Sah, K. Masuda, and J. M. Carlson. (2018) Novel magnetic resonance technique for characterizing mesoscale structure of trabecular bone. *Royal Society Open Science* 5: 180563.
- C. Nguyen** and J. M. Carlson. (2016) Optimizing real-time vaccine allocation in a stochastic SIR model. *PLOS ONE* 11(4): e0152950.

PUBLICATIONS IN CONFERENCE PROCEEDINGS

- C. Nguyen**, I. Huang, and O. Peleg. (2022) Firefly-inspired vocabulary generator for communication in multi-agent systems. In the *ALIFE 2022: The 2022 Conference on Artificial Life*. doi.org/10.1162/isal_a_00511
- C. Nguyen**, K. J. Schlesinger, and J. M. Carlson. (2017) Data-driven models for individual and group decision making. In the *Proceedings of the 2017 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining*. doi.org/10.1145/3110025.3116204
- C. Nguyen**, K. J. Schlesinger, and J. M. Carlson. (2017) Collective decision dynamics in group evacuation. In the *Proceedings of the Summer Computer Simulation Conference 2017*. doi.org/10.22360/SummerSim.2017.SCSC.002

PREPRINTS

- C. Nguyen**, I. Dromi, A. Kempinski, G. E. C. Gall, O. Peleg, Y. Meroz. (2022) Noise-mediated self-organization in mutually shading sunflowers. Preprint. [arXiv:2206.05540](https://arxiv.org/abs/2206.05540)

AWARDS AND FELLOWSHIPS

Rising Stars in Soft and Biological Matter, University of Chicago MRSEC	2021
GSNP Student Speaker Award Finalist, American Physical Society	2019
DBIO Shirley Chan Student Travel Grant, American Physical Society	2019
Graduate Opportunity Fellowship, UCSB Graduate Division	2017
Worster Summer Research Fellowship (as graduate mentor), UCSB Physics	2017
Doctoral Student Travel Grant, UCSB Academic Senate	2017
Chair's Outstanding Service Award, UCSB Physics	2017
Herbert P. Broida Fellowship, UCSB Physics	2013
Doctoral Scholars Fellowship, UCSB Graduate Division	2013
Summer Undergraduate Research Fellowship, California Institute of Technology	2012
Roland L. Carpenter Memorial Scholarship, CSULA Physics and Astronomy	2012
Larry Chu Scholarship, CSULA Physics and Astronomy	2011

RECENT PRESENTATIONS

Conference on Artificial Life (Virtual)	Jul 19, 2022
“Firefly-inspired vocabulary generator for communication in multi-agent systems”	
Frontiers in Applied and Computational Mathematics (Newark, NJ)	May 20, 2022
“Collective locomotion in entangled living active matter” (Invited)	

Rising Stars in Soft and Biological Matter Symposium (Virtual) “Emergent collective behavior in entangled worm blobs” (Invited)	Sep 24, 2021
APS March Meeting (Chicago, IL) “Modeling evolution of firefly-like signal vocabularies”	Mar 17, 2022
International Symposium on Swarm Behavior and Bio-Inspired Robotics (Virtual) “Firefly-inspired vocabulary generator for communication in multi-agent systems”	Jun 3, 2021
APS March Meeting (Virtual) “Modeling collective dynamics of aquatic worm blobs”	Mar 15, 2021
SICB (Society for Integrative and Comparative Biology Annual Meeting) (Virtual) “Modeling collective dynamics of aquatic worm blobs”	Jan 3, 2021
CSULA Physics & Astronomy Colloquium (Virtual) “The physics of collective animal behavior” (Invited)	Sep 10, 2020

TEACHING

Teaching Assistant, Cajal Summer School on Quantitative Approaches to Behaviour	2022
Teaching Assistant, UCSB	
• Observational Astrophysics	Spring 2015
• Advanced Mechanics	Winter 2015
• Introductory Experimental Physics A	Fall 2015, Winter 2014
• Introductory Experimental Physics B	Spring 2014

SKILLS

Programming languages: MATLAB, Python

Other applications: Mathematica, LaTeX, Processing, Abaqus FEA, Adobe Creative Suite

Operating systems: Mac OS, Windows, Linux

Languages: English (native), French (basic)

OTHER ACTIVITIES

Team member, The <i>Living Histories</i> talk series	2021–
Member, APS DBIO Community Engagement Committee	2021
Organizing committee member for the 2019 Conference for Undergraduate Women Physics at UCSB	2018–2019
Board member, UCSB Women in Physics	2015–2019
• Organized round-table discussions on the gender gap and sexual harassment in academia	

- Organized lunch talks with visiting women professors and scientists from local companies
- Organized advice sessions on research involvement and applying to graduate school for UCSB undergraduates
- Participated in outreach activities and science demonstrations at local schools and the Girls Inc. after-school program

Physics Circus, UCSB

2013–2019

- Led science demonstrations at local elementary schools

Secretary, CSULA Physics and Astronomy Club

2012–2013