Ben T. Larson

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Education and Training

University of California, San Francisco — San Francisco, CA
Postdoc, Biophysics, Laboratory of Cell Geometry — *2019-present*
Mentor: Wallace Marshall

Marine Biological Laboratory — Woods Hole, MA
Physiology Course — *2016*

University of California, Berkeley — Berkeley, CA
PhD, Biophysics with Designated Emphasis in Computational Biology, Animal Origins Lab — *2014-2019*
Mentor: Nicole King

National Institutes of Health, NHLBI — Bethesda, MD
Postbac, Biophysics, Laboratory of Molecular and Cellular Imaging — *2012-2014*
Mentor: Justin Taraska

Reed College — Portland, OR
BA, Physics — *2008-2012*

Fellowships, Honors, and Awards

Merck Postdoctoral Fellowship
Jane Coffin Childs Memorial Fund for Medical Research — *2020-2023*

Porter Prize for Research Excellence
American Society for Cell Biology — *2022*

Best Talk
Gordon Research Seminar, Plant and Microbial Cytoskeleton — *2022*

Summer Program
Aspen Center for Physics, Learning Dynamical Models from Biophysical Data — *2022*

Graduate Research Fellowship
National Science Foundation — *2016-2019*

Post-course Research Award
Marine Biological Laboratory, Physiology Course — *2016*

Society of General Physiology Scholar
Society of General Physiology — *2016*

Orloff Science Award
National Institutes of Health — *2013*

Post-baccalaureate Intramural Research Training Award
National Institutes of Health — *2012-2014*

Phi Beta Kappa
Reed College — *2012*

Commendation for Academic Excellence
Reed College — *2008-2012*

Ruby-Lankford Grant for Faculty-Student Collaborative Research
Reed College — *2010*

Publications

Google Scholar, *ORCID*

1. BT Larson, J Garbus, JB Pollack, WF Marshall
A unicellular walker controlled by a microtubule-based finite-state machine
Curr. Biol. 32 (17) *2022*

Using theory and experiments, we found that the ciliate *Euplotes* walks across surfaces with an unusual, complex gait involving elements of stereotypy and variability according to a computational process and coordinated by a system of bundled microtubules. This work sheds light on how cells control complex behaviors and embody computational processes. Highlighted in popular press outlet New Scientist.

2. NT Chartier*, A Mukherjee*, J Pfanzelter*, S Fürthauer, BT Larson, M Kreysing, F Jülicher, SW Grill
A hydraulic instability drives the cell death decision in the nematode germline
Nat. Phys. doi: 10.1038/s41567-021-01235-x *2021*

3. BT Larson, T Ruiz-Herrero, S Li, S Kumar, L Mahadevan, N King
Biophysical principles of choanoflagellate self-organization
Proc. Natl. Acad. Sci. 117 (3) *2020*

Focusing on the biophysical principles underlying colony morphogenesis in choanoflagellates (the closest living relatives of animals), this work reveals the crucial role of the extracellular matrix (ECM) in shaping the colonies and leads to a phase diagram that delineates the range of morphologies as a function of the biophysical mechanisms at play. This work provides new evidence for the importance of ECM and of the interplay between cell biology and biophysical mechanisms in the evolutionary origins of animals and in morphogenesis.

4. T Brunet*, BT Larson*, TA Linden*, MJA Vermeij, KL McDonald, N King
Light-regulated collective contractility in a multicellular choanoflagellate
Science 366 (6463) *2019*

This paper reports a previously undescribed species of choanoflagellate that forms cup-shaped colonies capable of rapidly and reversibly inverting their curvature in response to changes in light. Inversion requires apical acto-myosin contractility and mediates a transition between feeding and swimming behavior. These findings inform reconstructions of hypothesized animal ancestors that existed before the evolution of specialized sensory and contractile cells. Highlighted in journals Science, eLife, and Current Biology and popular press outlets Scientific American, Science News, and Science Daily.

5. D Laundon, BT Larson, KL McDonald, N King, P Burkhardt
The architecture of cell differentiation in choanoflagellates and sponge choanocytes
PLOS Biol. 17 (4) *2019*

6. BT Larson, KA Sochacki, JM Kindem, JW Taraska
Systematic spatial mapping of proteins at exocytic and endocytic structures
Mol. Biol. Cell 25 (13) *2014*

7. MA Bedau and BT Larson
Lessons from environmental ethics about the intrinsic value of synthetic life
GA Kaebnick and TH Murray (Ed.)
Synthetic biology and morality: artificial life and the bounds of nature, MIT Press *2013*

8. KA Sochacki, BT Larson, DC Sengupta, MP Daniels, G Shtengel, HF Hess, JW Taraska
Imaging the post-fusion release and capture of a vesicle membrane protein
Nat. Comm. 3 (1) *2012*

**denotes equal contribution*

Selected Presentations

APS March Meeting† *2023*
Data-driven Dynamical Systems in Biology and Soft Matter Symposium, American Physical Society Las Vegas, NV

Quantitative Biosciences Seminar† *2023*
Georgia Institute of Technology

Biology Seminar† *2023*
Stanford University

Organismal Biology Seminar† *2023*
University of Chicago

Quantitative Biology and Biophysics Seminar† *2023*
Carnegie Mellon University

Molecular and Cellular Biology Seminar† *2023*
Harvard University

Eugene Bell Center Seminar† *2023*
Marine Biological Laboratory

SICB Annual Meeting† *2023*
Microscale Life Symposium, Society for Integrative and Comparative Biology, Austin, TX

Cell Bio Annual Meeting† *2022*
ASCB/EMBO, New Organisms; New Directions Symposium, Washington, DC

Genotype to Phenotype: Bridging Comparative Genomics and Cell Biology Workshop* *2022*
The Company of Biologists, Buxted Park, UK

ASCB/EMBO Annual Meeting* *2016, 2021*
American Society for Cell Biology, European Molecular Biology Organization

Optical Engineering for the Biological Sciences Course† *2022*
Department of Biology, San Francisco State University

Cilia Supergroup† *2022*
University of California, San Francisco

Plant and Microbial Cytoskeleton*,† *2022*
Gordon Research Seminar and Conference

Summer Coding Immersion Program† *2022*
San Francisco State University

APS March Meeting* *2022*
American Physical Society, DBIO

Microbiology Seminar† *2022*
Department of Microbiology and Molecular Genetics, UC Davis

Established and Emerging Model Organisms Course† *2022*
Department of Biology, Duke University

US Protistology Network† *2021*
Independently organized, various institutions

Biological Physics and Physical Biology Seminar† *2021*
Independently organized, various institutions

Stochastic Physics in Biology* *2021*
Gordon Research Conference and Seminar

Cellular Dynamics and Models* *2021*
Cold Spring Harbor Laboratory

BioWeb Conference† *2021*
Department of Biological Sciences, Smith College

Build-a-Cell Seminar† *2020*
NSF Build-a-Cell Network

Electronic Symposium on Protistology† *2020*
Independently organized, various institutions

Biophysics Seminar† *2019*
Life Sciences Institute, Exeter University

Bio Lunch† *2019*
Department of Applied Mathematics and Theoretical Physics, Cambridge University

Size and Shape Workshop* *2018*
European Molecular Biology Organization, NCBS/INSTEM

International Choanoflagellate Workshop*,* *2015, 2017*
Station Biologique de Roscoff, UC Berkeley

Integrated Microbial Biodiversity *2016*
Canadian Institute for Advanced Research

BPS Annual Meeting *2014, 2022*
Biophysical Society

Upcoming
†*Invited talk*
**Talk selected from abstract*

Teaching and Mentorship

Lecturer
Department of Biology, San Francisco State University, San Francisco, CA *2022*
Biol 861: Advances in Cell and Molecular Biology. Seminar-based course for graduate and advanced undergraduate students emphasizing recent progress in understanding how diverse cells control shape and movement.

Lead Instructor
Center for Cellular Construction, CCC Summer Course, San Francisco, CA *2021, 2022*
Guided intensive research experience with students (undergrad-PhD) from SFSU and UCSF emphasizing quantitative image analysis.

Undergraduate and PhD Student Mentor
Laboratory of Wallace Marshall, University of California, San Francisco *2019-present*
Bioengineering undergrad Ching Ng (UC Merced), Biophysics PhD student Greyson Lewis (UCSF), Computer Science PhD student Jack Garbus (Brandeis), and MBL Physiology post-course research students Veronica Farmer (Vanderbilt) and Alice Herneisen (MIT).
Laboratory of Nicole King, University of California, Berkeley *2017-2019*
Physics undergrad Kevin Marroquin, MCB undergrads Sheel Chandra and Jake Hira, MCB PhD student Max Ferrin, and Biophysics PhD students Mike Levy and Ben McInroe (all UCB).

Teaching Assistant
Marine Biological Laboratory, Physiology Course, Woods Hole, MA *2018, 2021, 2022*
Evolution of Genomes, Cells, and Development, University of California, Berkeley *2016*

Service and Outreach

Special Interest Subgroup Co-organizer
ASCB Annual Meeting, Cells in the wild: environmental influences on cell morphology and behavior *2021*
With Guillermina Ramirez-San Juan and David Booth.

Protist Editor
International Microbiology Literacy Initiative *2021-present*
Aims to foster understanding and appreciation of microbes through open-access school curriculum development

Reviewer
Various journals *2019-present*
Nature Communications, eLife, Philosophical Transactions of the Royal Society B

Data Science Mentor
Gaza Sky Geeks *2018-present*
Included delivering lectures to Gaza's first tech hub covering topics in exploratory data analysis, basic approaches to quantitative analysis of data, and effective communication of results.

Cell Biology and Microscopy Outreach *2014-present*
Venues such as Exploratorium, California Academy of Sciences, Chabot Space & Science Center, and Oakland schools

Cellular Basis of Patterns Working Group Co-founder and Co-organizer
University of California, Berkeley *2015-2017*
Interdepartmental seminar series and collaborative network dedicated to fostering a community of researchers interested in self-organization and pattern formation in biological systems. With Amy Shyer and Mike Levy.

Nuclear Reactor Operator
Reed Research Reactor *2008-2012*
Licensed by the Nuclear Regulatory Commission in 2009, responsibilities included training new operators, giving tours to the public, reactor operation, and detector calibration