Deepak Krishnamurthy

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Curriculum Vitae

Education

Sep. 2014 – Jan. 2021 **Ph.D. in Mechanical Engineering**, *Stanford University*
Organismal biophysics and microscope development

2014 **M.S. in Engineering Mechanics**, *JNCASR, Bengaluru*
Specialization: Microhydrodynamics and transport phenomena

2011 **B.E. (Hons) in Mechanical Engineering**, *BITS-Pilani*

Research Experience

Sep. 2021 – present **BWF-CASI Postdoctoral Fellow**, *Laboratory of Prof. Daniel Fletcher, UC Berkeley*
Cell adhesion, Self-organization, Biological assembly
- Adhesion mediated self-assembly in loricate choanoflagellates
- Collaborating with Prof. Nicole King's lab on choanoflagellate cell biology
- Developing new high-throughput force manipulation methods for single molecules and cells

Sep. 2014 – Jan. 2021 **PhD Research**, *Laboratory of Prof. Manu Prakash, Stanford University*
Thesis: Multiscale Approaches to Study the Biophysics of Parasites and Plankton
- Invented a new microscopy paradigm: "Scale-free Vertical Tracking Microscopy"
- Led an interdisciplinary team in microscope design, development, scale-up and field-deployment
- Experimental measurements, theoretical and robotics-based models to understand motility of the *Schistosoma mansoni* parasite.

Aug 2011 – Jun 2014 **Masters Thesis Research, JNCASR, Bengaluru**, *Prof. Ganesh Subramanian*
MS Thesis: Part I: Heat or Mass Transport from Drops in Shearing Flows
Part II: Collective Motion in Micro-scale Swimmer Suspensions

Jun 2010 – Dec 2010 **Summer Internship & Undergraduate Thesis**, *Simon Fraser University*, Vancouver, BC, Canada
Computational modelling of a microfluidic fuel cell with flow-through porous electrodes.

Scientific Biosketch

I am a biophysicist and engineer who develops new experimental tools and frameworks to connect single-cell processes to ecological and planetary-scale phenomena. During my PhD with Manu Prakash at Stanford University, I invented *Scale-free Vertical Tracking Microscopy* to study how marine microbes and aggregates move across ecologically relevant depths, opening new windows on microscale ocean processes. As a postdoctoral fellow in Daniel Fletcher's lab at UC Berkeley, I expanded into cell biology, biophysics, and tool development, creating microbubble-based force manipulation assays and light-controlled switches for Cas13 enzymes. In collaboration with Nicole King's group, I launched a new research direction on loricate choanoflagellates, illuminating how single cells assemble robust extracellular architectures that underpin ocean carbon cycling. Together, these experiences position me to lead a research program that unites cell biology, soft matter physics, and climate-relevant ocean science under the emerging theme of *microscale ocean biophysics*.

Research Funding, Fellowships and Awards

2024 **Burroughs Wellcome Fund, Career Awards at the Scientific Interface (CASI). Awardee.** (**$560,000**, **5 years**, **Role: PI**).

2023 Catalyst Seed Grant Award, Schmidt Science Fellows. Project: *Emergent Mechanosensation in Immune Cell Behavior.* ($10,000).

2020 **Schmidt Science Fellowship.** (**$200,000**, **2 years**).

2012–2015 Bio-X Bowes Family Fellowship, Stanford University. Full tuition + stipend for 3 years.

2012 Stanford Graduate Fellowship (declined).

2012 Pfizer Inc. Endowed Scholarship, Marine Biological Laboratory Physiology Course. Full tuition support.

2012 HHMI Visiting Scientist Grant, Janelia Farm. Partial support for post-course research.

2012–2014 JNCASR Senior Research Fellowship, Government of India. Full tuition + stipend.

2012 DST Travel Fellowship, Government of India.

2025 Best Selected Talk, 2nd place, International Choanoflagellates and Friends Meeting, Paris.

2018 Best Lightning Talk, Microscale Ocean Biophysics Meeting, Whistler, Canada.

2018 Rowland Junior Fellowship Finalist, Harvard University.

2016 Best Poster Award (across categories, ~100 contestants), Mechanical Engineering Conference, Stanford University.

2014 Roddam Family Award for Best Master's Thesis, JNCASR.

2012 All India Rank 4, Graduate Aptitude Test in Engineering (GATE), Engineering Sciences.

2011 Ranjit Singh Chauhan Award for Excellence in Undergraduate Research, BITS-Pilani.

2010 Research Productivity Award, Simon Fraser University, Canada.

2010 MITACS Globalink Scholar, Canada.

2010 Best Student Project, APOGEE Technical Festival, BITS-Pilani.

2008–2012 BITS-Pilani Merit Scholarship.

Publications

Peer-reviewed Publications

† co–corresponding author

2025 Cornell, C. E., Chorlay, A., **Krishnamurthy, D.**, Martin, N. R., Baldauf, L., & Fletcher, D. A. *Target cell cortical tension regulates macrophage trogocytosis. Nature Cell Biology* (2025). (doi:10.1038/s41556-025-01807-6).
News & Views: Wu, C., Liu, Z. *Mechanical switch from nibbling to engulfment. Nature Cell Biology* (2025). (doi:10.1038/s41556-025-01818-3).

2023 **Krishnamurthy, D.†** , & Prakash, M. *Emergent programmable behavior and chaos in dynamically driven active filaments. Proc. Natl. Acad. Sci. USA*, 120(28), e2304981120. (doi:10.1073/pnas.2304981120).

2023 **Krishnamurthy, D.†** , Pepper, R., & Prakash, M. *Active sinking particles: sessile suspension feeders significantly alter the flow and transport to sinking aggregates. J. R. Soc. Interface*, 20(199), 20220537. (doi:10.1098/rsif.2022.0537).

2020 **Krishnamurthy, D.**, Li, H., Benoit du Rey, F., Cambournac, P., Larson, A., Li, E., & Prakash, M. *Scale-free Vertical Tracking Microscopy. Nature Methods*, 17(10), 1040–1051. (doi:10.1038/s41592-020-0924-7). Project website | Media coverage: Nature Methods News & Views | Stanford News | TechCrunch | Hakai Magazine.

2019 Coyle, S. M., Flaum, E., Li, H., **Krishnamurthy, D.**, & Prakash, M. *Coupled active systems encode emergent behavioral dynamics of the unicellular predator Lacrymaria olor. Current Biology*, 29(19), 3838–3850.e3. (doi:10.1016/j.cub.2019.09.034).

2018 **Krishnamurthy, D.**, & Subramanian, G. *Heat or mass transport from drops in shearing flows. Part 1. The open-streamline regime. Journal of Fluid Mechanics*, 850, 439–483. (doi:10.1017/jfm.2018.439).

2018 **Krishnamurthy, D.**, & Subramanian, G. *Heat or mass transport from drops in shearing flows. Part 2. Inertial effects on transport. Journal of Fluid Mechanics*, 850, 484–524. (doi:10.1017/jfm.2018.481).

2018 Ilton, M., Bhamla, M. S., Ma, X., Cox, S. M., Fitchett, L. L., Kim, Y., *et al.* [incl. **Krishnamurthy, D.**] *The principles of cascading power limits in small, fast biological and engineered systems. Science*, 360(6387), eaao1082. (doi:10.1126/science.aao1082).

2016 **Krishnamurthy, D.**, Katsikis, G., Bhargava, A., & Prakash, M. *Schistosoma mansoni cercariae exploit an elastohydrodynamic coupling to swim efficiently. Nature Physics*, 13, 266–271. (doi:10.1038/nphys3924).

2015 **Krishnamurthy, D.**, & Subramanian, G. *Collective motion in a suspension of micro-swimmers that run-and-tumble and rotary diffuse. Journal of Fluid Mechanics*, 781, 422–466. (doi:10.1017/jfm.2015.473).

2011 **Krishnamurthy, D.**, Johansson, E. O., Lee, J. W., & Kjeang, E. *Computational modeling of microfluidic fuel cells with flow-through porous electrodes. Journal of Power Sources*, 196(23), 10019–10031. (doi:10.1016/j.jpowsour.2011.08.024). *[Undergraduate Research]*

2011 **Krishnamurthy, D.**, Rathore, J. S., & Sharma, N. N. *Nanorobot Propulsion Using Helical Elastic Filaments at Low Reynolds Numbers. ASME J. Nanotechnol. Eng. Med.*, 2(1), 011009. (doi:10.1115/1.4003300). *[Undergraduate Research]*

Manuscripts Under Review

2025 **Krishnamurthy, D.***, Ng, C. F.*, Dextre, A. A., Chorlay, A., Ott, M., & Fletcher, D. A. *LUCas: Light-Uncaged Cas13a using photo-cleavable interfering guide RNAs.* Submitted, 2025. (*co–first authorship; patent application filed*).

Preprints

2020 Li, H., **Krishnamurthy, D.**, Li, E., Vyas, P., Akireddy, N., Chai, C., & Prakash, M. *Squid: Simplifying Quantitative Imaging Platform Development and Deployment. bioRxiv.* (bioRxiv).

2020 Li, H., Li, E., **Krishnamurthy, D.**, Kolbay, P., Chacin, B., Hoehne, S., Cybulski, J., *et al. Utah–Stanford Ventilator (Vent4US): Developing a rapidly scalable ventilator for COVID-19 patients with ARDS.* (medRxiv).

Manuscripts in Preparation

Krishnamurthy, D., Chorlay, A., King, N., & Fletcher, D. A. *Cellular transformers: Surface glycans mediate robust assembly of silica cages in loricate choanoflagellates.* (in preparation).

Patents

2025 [US Patent Filed] *"Photocleavable Interfering Guide RNAs And Uses Thereof."* **Krishnamurthy, D.**, Ng Pitti, C., & Fletcher, D. Filed May 2025.

2021 [US Patent Granted] **Krishnamurthy, D.**, & Prakash, M. *Hydrodynamic treadmill: a tracking device to study biotic/abiotic systems in gravitational and hydrodynamic fields.* U.S. Patent 11,033,006. Issued June 15, 2021. (Google Patents link).

Invited Talks and Seminars

2025 **Selected Talk:** *Cellular Transformers: Surface Glycans Mediate Robust Assembly of Silica Cages in Loricate Choanoflagellates*. American Society for Cell Biology (ASCB) Annual Meeting, Session: *Cell Biology at the Extremes*,Philadelphia, PA. (Dec 2025).

2025 **Invited Talk:** *Cellular Transformers: Surface Glycans Mediate Robust Assembly of Silica Cages in Loricate Choanoflagellates*. University of Pennsylvania, Department of Physics, Philadelphia, PA. (Dec 2025).

2025 **Keynote:** Science Showcase Speaker, Schmidt Science Fellows Interdisciplinary Science Summit, Pasadena, USA. (July 2025). (Talk video link).

2025 **Selected Talk:** *Biophysics of microscale adhesion and assembly in Loricate choanoflagellates*. Institut Pasteur, Paris, France. (May 2025).

2024 **Invited Seminar:** *Emergent programmable behavior and chaos in dynamically driven active filaments*. Biological Physics and Physical Biology Seminar. (July 2024).

2023 **Invited Seminar:** *Active sinking particles: Sessile filter-feeders fundamentally alter flow and transport to sinking aggregates*. ASLO Workshop. (June 2023).

2022 **Invited Seminar:** *Active sinking particles: Sessile filter-feeders fundamentally alter flow and transport to sinking aggregates*. Physics Seminar, University of Puget Sound, USA. (2022).

2021 **Invited Seminar:** *Active sinking particles: Sessile filter-feeders can fundamentally alter the fate of sinking aggregates*. Technical University of Denmark (DTU). (Feb 2021).

2018 **Invited Seminar:** *Novel multi-scale tools for ocean biophysics*. Rowland Institute, Harvard University, USA. (Oct 2018).

2018 **Invited Seminar:** *Life under gravity: bridging scales in the ocean*. Department of Molecular and Cell Biology, UC Berkeley, USA. (Oct 2018).

2016 **Invited Seminar:** *Biophysics of swimming and host-seeking in Schistosoma mansoni cercariae*. Carbon Inc., Redwood City, California, USA. (Jan 27, 2016).

2016 **Invited Seminar:** *Investigation of the swimming mechanics of Schistosoma mansoni cercariae and its role in disease transmission*. Department of Molecular, Cell and Developmental Biology, UC Santa Cruz, USA. (Feb 9, 2016).

Field Research Experience

Dec 2019 **HOT-317 Cruise, R/V *Kilo Moana***, *Hawai'i Ocean Time-series*
Scale-free tracking microscopy of plankton.
- First measurements of single plankton behavior on-board a research vessel.
- Recorded >30 species, building a unique behavioral database.

Nov 2018 **Isla Magueyes Marine Station**, *Puerto Rico*
Single-cell measurements of planktonic diatoms.
- Discovered novel dynamic sinking behaviors in diatoms.
- Developed new methods for drag control measurements.

Jan – Jul 2018 **Hopkins Marine Station**, *Monterey Bay, California*
Behavioral quantification of planktonic microorganisms.
- Measured novel larval behaviors using vertical tracking microscopy.

Oct 2016 **Ranomafana National Park**, *Madagascar*
Field study of schistosomiasis ecology.
- Conducted snail sampling to locate hotspots of schistosomiasis.
- Linked parasite microscale behavior to macroscale ecology.

Teaching Experience

Jun 2025 **Course Instructor**, *Cell Physiology Course (Bootcamp/Skills Week)*, Marine Biological Laboratory (MBL), Woods Hole, MA
Taught an intensive advanced graduate module (12 hours of in-person lectures) on physical biology/biophysics theory and computation, combining lectures and interactive sessions.

Jul 2023 **Teaching Assistant**, *Physiology Course*, Marine Biological Laboratory (MBL), Woods Hole, MA
Designed and mentored advanced graduate student/postdoc projects during a 2-week intensive research rotation.

Jan–Mar 2015 **Teaching Assistant**, *Physical Biology of Macromolecules*, Stanford University
Led weekly tutorial sections, co-designed problem sets, and developed experimental demonstrations.

Jan–Apr 2013 **Teaching Assistant**, *Graduate Fluid Mechanics*, JNCASR, Bangalore
Prepared lecture notes, assignments/solutions, and conducted tutorial sessions and special lectures.

2010 **Lab Assistant**, *Prime Movers and Fluid Machines*, BITS-Pilani, India
Assisted with lab experiments on turbines, pumps, and IC engines

Research Mentorship

Jun – Aug 2023 **Ph.D. Bioengineering Student (1st year)**, *Jared Huzar, UC Berkeley*
Project: DNA-based receptors to study cell interface mechanics.

Jun – Aug 2019 **Ph.D. Bioengineering Student (1st year)**, *Ethan Li, Stanford University*
Project: Mechanical stage design for vertical tracking microscopy.

Aug – Dec 2017 **Ph.D. Bioengineering Student**, *Elgin Korkmazhan, Stanford University*
Project: Controlling transient flows in a hydrodynamic treadmill.

Apr – Jun 2019 **Graduate Student**, *Delphine Mion, École Polytechnique*
Project: Density modulation in planktonic diatoms.

Apr – Jul 2018 **Graduate Student**, *François Benoit Du Rey, École Polytechnique*
Project: Hydrodynamic treadmill for tracking microscopy.

Apr – Jul 2017 **Graduate Student**, *Pierre Cambournac, École Polytechnique*
Project: Hydrodynamic treadmill for tracking microscopy.

Apr – Jul 2016 **Graduate Student**, *Fabien Cockenpot, École Polytechnique*
Project: Ultrafast motility in *Halteria grandinella*.

Dec 2014 – Dec 2015 **M.S. Student, Applied Physics**, *Arjun Bhargava, Stanford University*
Project: Scaled-up robot to study *Schistosoma* cercariae swimming.

Mar – Aug 2019 **B.S. Engineering Physics Student**, *Matteo Massey, Stanford University*
Project: Virtual-reality paradigm for single-cell ocean environments.

Outreach & Professional Service

2025 **Invited Scientist**, Teacher Workshop, Exploratorium (San Francisco). Contributed to developing new methods for teaching cell biology in the classroom.

2020–present **Invited Reviewer** for journals including *Nature Communications*, *Advanced Science*, *Journal of Chemical Physics*, *Journal of Experimental Biology*, and *Environmental Fluid Mechanics*.

Mar – Dec 2020 **Volunteer Engineer**, Pez-globo international academic–industry partnership. Contributed to pneumatics and power subsystems of the open-source PufferFish ventilator for COVID-19 patients.

Machine Shop Director, Shriram Center basement lab cluster (Stanford).

2015–2019 Volunteer, Bio-X Science Day. Designed interactive demos to communicate scientific concepts to the public.

2014 Volunteer, APS Division of Fluid Dynamics Annual Meeting, San Francisco.

Conducted Foldscope workshops across the Bay Area, Stanford, and schools in San Juan and Magueyes, Puerto Rico.

References

(1) Prof. Manu Prakash
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Associate Professor, Bioengineering
Stanford University
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(2) Prof. Daniel Fletcher
Postdoctoral advisor
Professor, Bioengineering
UC Berkeley
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(3) Prof. Nicole King
Postdoctoral co-mentor and collaborator
Professor, Molecular & Cell Biology
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(4) Prof. Rob Phillips
Mentor
Professor, Department of Physics
Division of Biology and Biological Engineering
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