

# Ethan Li

Pronouns: they/them

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## Education

### PhD in Bioengineering

Stanford University (Stanford, CA)

Started September 2018, defending December 2024

Advised by Prof. Manu Prakash

### MS in Computer Science

Stanford University (Stanford, CA)

Graduated June 2018

Specialization in Artificial Intelligence

### BS in Bioengineering

Stanford University (Stanford, CA)

Graduated June 2016

Graduated with Distinction, Tau Beta Pi

## Research & Engineering Experience

### PhD Student

Summer 2019 - Present

Prakash Lab, Stanford University (Stanford, CA)

Advised by Prof. Manu Prakash

- Developing systems and infrastructure for geographically-distributed interactive microscopy networks. Developed and currently operating a prototype cluster ([Ten-Earth](#)) of remotely-operable microscopes with a self-hosted software platform (Go + SQLite + Open Policy Agent + Hotwire Turbo + Hotwire Stimulus + ZeroTier +

Terraform + Nomad + Caddy + GCP) for privileged administration and unprivileged public access.

- Developing GitOps-inspired software deployment & configuration system ([Forklift](#)) for composable, reprovisionable, and decentralized management of system/application software (Docker containers, static binaries, and shell scripts) and configurations on embedded Linux systems, designed to facilitate scalable system administration across networks of individually-customizable open-source scientific instruments.
- Led software development and maintenance for an open-source microscopy project ([PlanktoScope](#)). Open-source maintainership responsibilities included release engineering over two annual software release cycles, implementation of continuous integration automation (GitHub Actions), documentation & improvement of [operating system architecture](#) and [software development processes](#), integration of third-party applications (via Docker Compose + Forklift + Caddy), improvement & maintenance of backend software (Python), improvement & maintenance of the project's documentation system and software documentation (MkDocs), change management (alpha/beta-based release train), mentorship of project contributors and interns, and issue triaging & troubleshooting support for open-source community members.
- Implemented and led 45 days of continuous research operations with a PlanktoScope for plankton biodiversity quantification aboard a research cruise ([The Tale of Three Systems: Fate of Primary Production in the Chukchi Sea](#)) on R/V Sikuliaq in the Arctic Ocean.
- Prototyped ultra-low-cost hand-powered centrifuge ([Handyfuge](#)) for clinical and scientific applications in field work and low-resource settings without electricity.
- Supported hardware development (EasyEDA+KiCAD) and clinical validation testing of low-cost automated scanning microscope platform ([Octopi/Squid](#)) for infectious disease diagnosis and advanced microscopy, including field work at the Infectious Diseases Research Collaboration in Tororo, Uganda.
- Developed embedded (STM32), backend (Python), and frontend (TypeScript+React) software for an open-source ventilator ([Vent4US/Pufferfish](#)) designed for local manufacturing and for long-term clinical use globally, including in resource-limited settings. Led the software development team, including architectural decision-making and implementation of IEC 62304-related processes for tech transfer to manufacturing partners.
- Supported hardware development (OnShape) of a vertical tracking microscope ([Gravity Machine](#)) to study vertical migration behavior and physiology of marine plankton.
- Supported hardware and software development of low-cost punchcard programmable microfluidics platform for molecular diagnostics.

## **Research Assistant**

Winter 2017 - Summer 2018

Riedel-Kruse Lab, Stanford University (Stanford, CA)

Advised by Prof. Ingmar H. Riedel-Kruse

- Designed and prototyped low-cost liquid handling robot for benchtop lab automation, with serial command protocol and Python API.
- Developed visual block-based programming interface to robot controller for students and programming novices.
- Worked with collaborators to transfer design to small-scale manufacturing and deployment in user studies.

## **Software Engineering Intern**

Summer 2017

HELLA Ventures Silicon Valley (Sunnyvale, CA)

- Prototyped novel human-machine interface design for driver control and supervision of semi-autonomous vehicles.
- Conducted feasibility study for 3D point cloud reconstruction algorithms in the proposed interface. Designed and implemented camera rig for testing of various reconstruction algorithms.

## **Research Assistant**

Summer 2016 - Winter 2017

Perinatal Safety Learning Lab, Lucile Packard Children's Hospital (Stanford, CA)

Advised by Prof. Henry C. Lee

- Prototyped and tested elements of an optimal visual display and user interface to improve clinical decision-making and situational awareness of time-critical health data for manual ventilation during infant resuscitation procedures.

## Software Engineering Intern

Summer 2016

TeselaGen Biotechnology (San Francisco, CA)

- Implemented core product features of cloud platform for computer-aided design & fabrication of DNA constructs.
- Built interface for automating fabrication workflows. Shipped in a release to Dow AgroSciences in Oct. 2016.

## Research Assistant

Spring 2013 - Summer 2015

KC Huang Lab, Stanford University (Stanford, CA)

Advised by Prof. KC Huang

- Developed software in MATLAB for automated statistical analysis and plotting of plate reader growth curve data to support high-throughput biological experiments.
- Developed software in C++ for computational modeling of prokaryotic cell wall mechanobiology. Conducted simulations on an HPC cluster managed by SLURM.

# Manuscripts

\* indicates equal contributions.

## Published or Accepted for Publication

**ESPressoscope: a small and powerful approach for *in situ* microscopy**

**Ethan Li**, Vittorio Saggiomo, Wei Ouyang, Manu Prakash, Benedict Diederich

PLOS ONE, accepted for publication in 2024

bioRxiv preprint: [doi.org/10.1101/2024.01.20.576174](https://doi.org/10.1101/2024.01.20.576174)

**DIY liquid handling robots for integrated STEM education and life science research**

**Ethan Li\***, Amy T Lam\*, Tamar Fuhrmann, Len Erickson, Mike Wirth, Mark L. Miller, Paulo Blikstein, Ingmar H. Riedel-Kruse

PLOS ONE, November 2022

[doi.org/10.1371/journal.pone.0275688](https://doi.org/10.1371/journal.pone.0275688)

**Scientific Inquiry in Middle Schools by Combining Computational Thinking, Wet Lab Experiments, and Liquid Handling Robots**

Tamar Fuhrmann, Deeana Ijaz Ahmed, Len Arikson, Mike Wirth, Mark L Miller, **Ethan Li**, Amy Lam, Paulo Blikstein, Ingmar Riedel-Kruse

IDC '21: Interaction Design and Children, June 2021

[doi.org/10.1145/3459990.3465180](https://doi.org/10.1145/3459990.3465180)

**Scale-free Vertical Tracking Microscopy**

Deepak Krishnamurthy, Hongquan Li, Francois Benoit du Rey, Pierre Cambournac, Adam Larson, **Ethan Li**, Manu Prakash

Nature Methods, August 2020

[doi.org/10.1038/s41592-020-0924-7](https://doi.org/10.1038/s41592-020-0924-7)

**Bacterial evolution in high osmolarity environments**

Spencer Cesar\*, Maya Anjur-Dietrich\*, Brian Yu, **Ethan Li**, Enrique Rojas, Norma Neff, Kerwyn Casey Huang

mBio, August 2020

[doi.org/10.1128/mBio.01191-20](https://doi.org/10.1128/mBio.01191-20)

**Preprints**

**AnmO<sub>2</sub>I: An open-source pulse-dose oxygen conserving device for the COVID-19 crisis**

Hongquan Li, Deepak Krishnamurthy, Anesta Kothari, **Ethan Li**, Michael Lipnick, David Gaba, Ruth Fanning, Manu Prakash

medRxiv, May 2021

[doi.org/10.1101/2021.05.19.21257477](https://doi.org/10.1101/2021.05.19.21257477)

**Squid: Simplifying Quantitative Imaging Platform Development and Deployment**

Hongquan Li, Deepak Krishnamurthy, **Ethan Li**, Pranav Vyas, Nibha Akireddy, Chew Chai, Manu Prakash

bioRxiv, January 2021

[doi.org/10.1101/2020.12.28.424613](https://doi.org/10.1101/2020.12.28.424613)

**Handyfuse-LAMP: low-cost and electricity-free centrifugation for isothermal SARS-CoV-2 detection in saliva**

**Ethan Li\***, Adam Larson\*, Anesta Kothari, Manu Prakash

medRxiv, July 2020

[doi.org/10.1101/2020.06.30.20143255](https://doi.org/10.1101/2020.06.30.20143255)

**Utah-Stanford Ventilator (Vent4US): Developing a rapidly scalable ventilator for COVID-19 patients with ARDS**

Hongquan Li\*, **Ethan Li\***, Deepak Krishnamurthy\*, Patrick Kolbay\*, Beca Chacin, Soeren Hoehne, Jim Cybulski, Lara Brewer, Tomasz Petelenz, Joseph Orr, Derek Sakata, Thomas Clardy, Kai Kuck, Manu Prakash

medRxiv, April 2020

[doi.org/10.1101/2020.04.18.20070367](https://doi.org/10.1101/2020.04.18.20070367)

## Under Preparation

**Forklift: A pragmatic approach to reproducibility in composing, extending, and upgrading open-source hardware-specific operating systems**

**Ethan Li**, Manu Prakash

Manuscript in progress

## Talks

***Ten-Earth: An Online Cluster of Low-Cost Microscopes to Monitor Plankton Population Dynamics in Complex Experimental Aquatic Communities***

**Ethan Li**, Jeonghyun An, Olivia Tomassetti, Abigail Cooper Cummings, Manu Prakash

Ocean Sciences Meeting 2024 (New Orleans, USA)

February 22, 2024

## Poster Presentations

***Ten-Earth: A system for cell-scale measurement of microbial population dynamics in complex aquatic communities***

**Ethan Li**, Olivia Tomassetti, Jeonghyun An, Abigail Cooper Cummings, Manu Prakash

CZ Biohub 2nd Physics of Life Symposium (San Francisco, USA)

October 12, 2023

***Optimizing oxygen saturation monitoring to aid decision-making in simulated neonatal resuscitation***

**Ethan Li**, Janine Bergin, Henry Lee, Janene Fuerch

Pediatric Academic Societies Meeting (Toronto, Canada)

May 8, 2018

## Awards & Honors

National Defense Science and Engineering Graduate (NDSEG) Fellowship

2019 - 2022

Sigma Xi Scientific Research Honor Society

Stanford Enhancing Diversity in Graduate Education (EDGE) Fellowship

Invited 2019

2018 - 2020

Tau Beta Pi Engineering Honor Society

Stanford President's Award for Academic Excellence in the Freshman Year

Inducted 2015

2013

## Teaching Experience

### Course Assistant

**Fall 2020**

BIOE 123: Biomedical System Prototyping Lab, Stanford University (Stanford, CA)

- Assisted in planning and developing materials for the next version of the course in winter 2021, with adjusted learning goals, a streamlined lab project, and an online-only format for remote lab learning.

### Course Assistant

**Winter 2019**

BIOE 123: Biomedical System Prototyping Lab, Stanford University (Stanford, CA)

- Assisted in teaching 40 students about principles and techniques for designing, fabricating, integrating, controlling, troubleshooting, and testing electromechanical hardware systems.
- Developed software infrastructure to enable easier integration between wireless IoT microcontroller devices and web platforms for creating online remote dashboards to hardware.
- Helped develop and deploy hands-on demonstration activities to support learning of practical electronics lab skills.

## **Course Assistant**

### **Winter 2018 - Spring 2018**

CS 210A/B: Software Project with Corporate Partners, Stanford University (Stanford, CA)

- Mentored four student project teams on needs finding, rapid prototyping, project management, and software engineering practices.

## **Course Assistant**

### **Winter 2017**

BIOE 123: Biomedical System Prototyping Lab, Stanford University (Stanford, CA)

- Assisted in teaching 30 students about principles and techniques for designing, fabricating, integrating, controlling, troubleshooting, and testing electromechanical hardware systems.
- Helped students learn to document their designs, including with functional block diagrams and specification tables.

## **Teaching Assistant**

### **Spring 2015**

ENGR 40M: Introduction to Electrical Engineering Lab, Stanford University (Stanford, CA)

- Taught students fundamental skills in breadboard circuit prototyping, circuit debugging, and Arduino programming.



## **Grader**

**Spring 2015**

BIOE 131: Ethics in Bioengineering, Stanford University (Stanford, CA)

- Graded technical briefings describing biomedical technologies.
- Provided constructive feedback to help students improve written communication skills in technical writing.