

Amy T. Lam, PhD
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Education

Columbia University

- **PhD**, *Biomedical Engineering*
- **MS**, *Biomedical Engineering*

2010 – 2016
February 2016
February 2012

California Institute of Technology

- **BS**, *Applied Physics* (with Honors)

2006 – 2010
June 2010

Research Experience

Postdoctoral Scholar

Stanford University, Stanford, CA
University of Arizona, Tucson, AZ

Biophysics of Multi-Cellular Patterns Laboratory

Adviser: Prof. Ingmar Riedel-Kruse

Projects

- Designed a setup for investigating fundamental principles of active matter and controllable swarming using *Euglena gracilis* as a model agent
- Developed a programming paradigm for controlling biological/microrobotic swarm agents
- Design and build prototype exhibits for interactive biology education at the Exploratorium to determine how modes of interactivity affect learning outcomes
- Investigate active self-assembly with genetically modified *E. coli* as a model system
- Run user studies on an ultra-low-cost liquid handling robot for STEM education

2015 – present

Graduate Research Assistant

Columbia University, New York City, NY

Laboratory for Nanobiotechnology and Synthetic Biology

Adviser: Prof. Henry Hess

Projects

- Created a proof-of-concept dynamically self-assembling system out of molecular motors and filaments capable of force-production, adaptation, and self-healing
- Developed a non-fouling surface coating functionalized with kinesin motor binding sites, weak enough to allow the kinesin to adsorb and desorb, but strong enough to support microtubule motility
- Controlled the size of structures formed through active self-assembly through motor protein gradient surfaces
- Determined the entropic cost to adsorption kinetics
- Compared structures arising from diffusion-driven and actively-driven (i.e. propelled) self-assembly

2010 – 2015

Summer Undergraduate Research Fellow

2008 and 2009

California Institute of Technology, Pasadena, CA

Cellular Morphodynamics and Imaging Lab

Adviser: Prof. Chin-Lin Guo

- Designed and created controllable PDMS microenvironments for the study of cellular differentiation and morphogenesis
- Optimized procedures for photolithography and production of microfluidic devices
- Performed basic biology lab protocols for gel electrophoresis, culturing cells, PCR, gene amplification, and protein purification

Summer Undergraduate Research Fellow

2007

California Institute of Technology, Pasadena, CA

Caltech Nanofabrication Group

Adviser: Professor Axel Scherer

- Wrote and debugged C software for concurrent operation of lab equipment

Publications

1. *First-hand and immersive full-body experiences with living cells and biotechnology through interactive museum exhibits.* A. T. Lam, J. Ma, C. Barr, P. Taylor, I. H. Riedel-Kruse, **Nature Biotechnology**, 37(10), 1238-1241 (2019).
2. *Polygonal motion and adaptable phototaxis via flagellar beat switching in the microswimmer *Euglena gracilis*.* A. Tsang, A. T. Lam, I. H. Riedel-Kruse, **Nature Physics**, 14(12), 1216-1222 (2018).
3. *Adaptive non-equilibrium molecular-scale systems with reversibly-bound molecular building blocks.* A. T. Lam, S. Tsitkov, Y. Zhang, H. Hess, **Nano Letters**, 18(2), 1530-1534 (2018).
4. *Device and programming abstractions for spatiotemporal control of active micro-particle swarms.* A. T. Lam, K. G. Samuel-Gama, J. Griffin, M. Loeun, L. C. Gerber, Z. Hossain, N. J. Cira, S. A. Lee, I. H. Riedel-Kruse, **Lab on a Chip**, 17(8), 1442-1451 (2017).
 - Listed as a “HOT” article (top 10% score during peer-review)
5. *Cytoskeletal motor-driven active self-assembly in in vitro systems.* A.T. Lam, V. VanDelinder, A.M.R. Kabir, H. Hess, G.D. Bachand, and A. Kakugo, **Soft Matter**, 12(4), 988-997 (2016).
6. *Controlling self-assembly of microtubule spools via kinesin motor density.* A.T. Lam, C. Curschellas, D. Krovvidi, and H. Hess, **Soft Matter**, 10(43), 8731-8736 (2014).
7. *Modeling negative cooperativity in streptavidin adsorption onto biotinylated microtubules.* S. He†, A.T. Lam‡, Y. Jeune-Smith‡, and H. Hess, ‡ indicates equal contribution, **Langmuir**, 28(29), 10635-10639 (2012).
8. *Nanoscale transport enables active self-assembly of millimeter-scale structures.* O. Idan, A.T. Lam, J. Kamcev, J. Gonzales, A. Agarwal, and H. Hess, **Nano Letters**, 12, 240-245 (2011).

Publications in Preparation

1. *Pac-Euglena: A Living Cellular Pac-Man Meets Virtual Ghosts.* A. T. Lam, J. Griffin, M. Loeun, N. Cira, S. A. Lee, I. H. Riedel-Kruse.
2. *A DIY Liquid Handling Robot for Integrated STEM Education.* E. Li, A. T. Lam, I. H. Riedel-Kruse.

Presentations

1. *Directed by light: microswimmer biophysics, swarm programming, and interactive exhibits.* **A. T. Lam**, A. C. H. Tsang, I. Riedel-Kruse, (talk) Molecules, Materials, Devices and Systems in Medicine, New York City, NY (2018).
2. *Compression and release dynamics of an active matter system of *Euglena gracilis*.* **A. T. Lam**, A. C. H. Tsang, N. Ouellette, I. Riedel-Kruse, (talk) American Physical Society March Meeting, New Orleans, LA (2017).
3. *Modeling cooperative self-assembly.* S. He, **A. T. Lam**, Y. Jeune-Smith, H. Hess, (poster) Biomedical Engineering Society Annual Meeting, Hartford, CT (2011).
4. *Near millimeter length microtubule wires: Bridging the gap between nanoscale and macroscale.* O. Idan, J. Kamcev, J. Gonzales, **A. T. Lam**, A. Agarwal, Y. Jeune-Smith, H. Hess, (poster) 17th International Conference on DNA Computing and Molecular Programming, Pasadena, CA (2011).
5. *Modeling cooperative self-assembly.* S. He, **A. T. Lam**, Y. Jeune-Smith, H. Hess, (poster) 8th Annual Conference on Foundations of Nanoscience: Self-Assembled Architectures and Devices, Snowbird, UT (2011).

Awards and Honors

- **Finalist for the Katharine McCormick Advanced Postdoctoral Scholar Fellowship** – awarded to support women in academic medicine (2018).
- **Morton B. Friedman Memorial Prize** – awarded periodically to an undergraduate or graduate student in the School of Engineering and Applied Sciences at Columbia University who best exhibits Dean Friedman's characteristics of academic excellence, visionary leadership, and outstanding promise for the future (2016).
- **The Yuen-huo Hung and Chao-chin Huang Award in Biomedical Engineering** – given to a graduating doctoral student in the Department of Biomedical Engineering at Columbia University who demonstrated great potential for making significant contributions to the fields of biomedical engineering and public health, and for serving as an ambassador of biomedical engineering (2016).
- Honorable Mention for **National Science Foundation Graduate Research Fellowship** (2011).
- Semi-finalist for **Doris S. Perpall Speaking Competition**, an undergraduate science presentation competition (2009).
- **Alexander P. and Adelaide F. Hixon Prize for Writing** – awarded to an undergraduate student for the best composition in a freshman humanities course. The prize recipient is chosen by a humanities committee (2007).

Teaching and Mentoring

Co-mentor for *Motorocracy* BIOMOD team, Columbia University 2014

- Project earned Gold Project Award, 2nd Best Presentation, and the MOLBOT award

Tutor for Star Learning Center, Goddard Riverside Community Center 2013

- Tutored an elementary school student from low-income household

Teaching Assistant, Columbia University 2011 – 2012

Thermodynamics of Biological Systems

Consultant, Hixon Writing Center 2007 – 2010

- Presented at the Southern California Writing Center's Conference in March 2009

Other Work Experience

Treasurer and Board Member, Art of Practicing Institute **2016 – 2019**

- Duties include fundraising, grant writing, and accounting for the 501(c) non-profit Institute

Staff Writer, Intern, *Engineering and Science Magazine* **2009**

- **Staying Firm Under Pressure.** Amy Lam. *Engineering and Science Magazine*. Fall 2009, 5-6

Editor, *little t* publication **2008 – 2009**

- The Caltech undergraduate guidebook
- Duties include recruiting advertisers, book layout, generating content
- The first *little t* in several years to be published on time and within budget

Skills

- *Nanofabrication*: Photolithography, mask design, process development, soft lithography
- *Biology*: Cell culturing, gel electrophoresis, gene amplification, protein purification, PCR
- *Modeling*: MATLAB, Mathematica
- *HCI*: User study design, interviewing
- *Classical piano*:
 - Solo recital at Klavierhaus (2013, New York City, NY)
 - Performed as a soloist with the Vienna International Orchestra (2012, Vienna, Austria)
 - Performed in AMEROPA International Music Festival (2010, Prague, Czech Republic)