YAN ZHANG

Presidential Postdoctoral Fellow
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EDUCATION

2017-22 **Georgia Institute of Technology** Atlanta, GA
Doctor of Philosophy in Chemical & Biomolecular Engineering
Thesis: New Interfaces to Advance Point-of-Care Biosensor Diagnostics

2013-17 **Cornell University** Ithaca, NY
Bachelor of Science in Chemical Engineering, *Cum Laude*

RESEARCH EXPERIENCE

2022- **Murray Lab, Division of Biology & Biological Engineering, Caltech**
Advisor: Prof. Richard M. Murray
- Leverage mass spectrometry-based proteomics to characterize cell-free proteome composition
- Utilize proteomics to identify sources of inter-lab variability in cell-free systems for standardization
- Characterize cell-free lysates from alternative growth phases for synthetic cell applications

2017-22 **Styczynski Lab, School of Chemical & Biomolecular Engineering, Georgia Tech**
Advisor: Prof. Mark P. Styczynski
- Innovated protocell arrays platform interfacing cell-free biosensors with polymer biphasic system for multiplexed analyte detection
- Integrated cell-free systems to a personal glucose monitor for field-deployable analyte quantification
- Characterized the effect of different lysate preparation methods on cell-free protein production and central metabolism

This work has resulted in 7 publications in *Nature Communications*, *Science Advances, ACS Synthetic Biology, PLoS Biology, JCED* (2 first-author and 5 co-author manuscripts), and 1 book chapter.

2015-16 **Lucks Lab, School of Chemical & Biomolecular Engineering, Cornell University**
Advisor: Prof. Julius B. Lucks (now at Northwestern University)
- Simulated RNA negative autoregulation network using mass action kinetics model to predict output
- Prototyped RNA networks in cell-free systems and implemented design in *E. coli* cells

This work resulted in 1 third-author publication in *ACS Synthetic Biology*.

FELLOWSHIPS, HONORS, AND AWARDS

2023 Best Ph.D. Thesis Award, Georgia Tech Chapter of Sigma Xi
2022 Caltech Presidential Postdoctoral Fellowship
2022 MIT Rising Stars in Chemical Engineering
2022 Georgia Tech Office of the Executive Vice President for Research (EVPR) Poster Award
2022 First Place, Georgia Tech F. L. "Bud" Suddath and Frances "Lee" Gafford Suddath Fellowship Award
2021 Most Dedicated Mentor Award in the 2021 iGEM Mentorship Program
2021 Georgia Tech Research Institute (GTRI) Graduate Student Fellow
2021 NextProf Nexus Program
2021 Georgia Tech ChBE Garry Betty Chair Fellowship
2018 Honorable Mention in NSF Graduate Research Fellowship
2016 Chi Alpha Epsilon National Honor Society Inductee
2016 Philips 66 Scholarship
2015 Ronald E. McNair Post-Baccalaureate Scholar

PUBLICATIONS

Journal Articles

8. McSweeney, M. A., **Zhang, Y.**, Styczynski, M. P. (2023). Short Activators and Repressors of RNA Toehold Switches. *ACS Synth Biol*, *12*(3), 681-688. [link]
7. Ahmed, T., **Zhang, Y.**, Lee, J.-H., Styczynski, M. P., & Takayama, S. (2022). Nucleic Acid Partitioning in PEG-Ficoll Protocells. *Journal of Chemical & Engineering Data*, *67*(8), 1964-1971. [link]
6. **Zhang, Y.**, Steppe, P. L., Kazman, M. W., & Styczynski, M. P. (2021). Point-of-Care Analyte Quantification and Digital Readout via Lysate-Based Cell-Free Biosensors Interfaced with Personal Glucose Monitors. *ACS Synth Biol*, *10*(11), 2862-2869. [link]
5. **Zhang, Y.**, Kojima, T., Kim, G. A., McNerney, M. P., Takayama, S., & Styczynski, M. P. (2021). Protocell Arrays for Simultaneous Detection of Diverse Analytes. *Nat Commun*, *12*(1), 5724. [link]
4. Miguez, A. M., **Zhang, Y.**, Piorino, F. & Styczynski, M. P. (2021). Metabolic Dynamics in Escherichia coli-Based Cell-Free Systems. *ACS Synth Biol*, *10*(9), 2252-2265. [link]
3. Byagathvalli, G., Sinha, S., **Zhang, Y.**, Styczynski, M. P., Standeven, J., & Bhamla, M. S. (2020). Electropen: an Ultra-Low-Cost, Electricity-Free, Portable Electroporator. *PLoS Biol*, *18*(1), e3000589. [link]
2. McNerney, M. P., **Zhang, Y.**, Steppe, P., Silverman, A. D., Jewett, M. C., & Styczynski, M. P. (2019). Point-of-Care Biomarker Quantification Enabled by Sample-Specific Calibration. *Sci Adv*, *5*(9), eaax4473. [link]
1. Hu, C. Y., Takahashi, M. K., **Zhang, Y.**, & Lucks, J. B. (2018). Engineering a Functional Small RNA Negative Autoregulation Network with Model-Guided Design. *ACS Synth Biol, 7*(6), 1507-1518. [link]

Book Chapters

2. **Zhang, Y.** and Hu, C. Y. (*accepted*). Chapter 13: Spatially Organized Circuits – Background: Compartmentalization in Biology. *The Art of Molecular Programming*. Molecular Programming Society. [link]
1. Miguez, A. M., **Zhang, Y.**, Styczynski, M. P. (2022). Metabolomics Analysis of Cell-Free Expression Systems Using Gas Chromatography-Mass Spectrometry. In: Karim, A. S., Jewett, M. C. (eds) *Cell-Free Gene Expression: Methods and Protocols*, vol 2433. Humana, New York, NY. [link]

Research Roadmaps:

2. Engineering Biology Research Consortium (2023). *An Assessment of Short-Term Milestones in EBRC's 2019 Roadmap, Engineering Biology*. [link]
1. Engineering Biology Research Consortium (2022). *Engineering Biology for Climate & Sustainability: A Research Roadmap for a Cleaner Future.* [link]

PRESENTATIONS

Talks

8. *"Protocell Arrays for Simultaneous Detection of Diverse Analytes."* Guest presentation, Paul Freemont and Yuval Elani Group, Imperial College London, London, U.K., April 2023.
7. *"Protocell Arrays for Simultaneous Detection of Diverse Analytes."* Young speaker, Synthetic Biology Young Speaker Series (SynBYSS), Global Virtual Seminar. March 2023. [link]
6. *"New Interfaces for Cell-free Biosensors to Enable Multiplexed Analyte Detection and Analyte Quantification at the Point of Care."* Invited talk, Richard Murray Group, Caltech, Pasadena, CA, March 2022.
5. *"New Interfaces for Cell-free Biosensors to Enable Multiplexed Analyte Detection and Analyte Quantification at the Point of Care."* Invited talk, Christopher Voigt Group, MIT, Boston, MA, March 2022.
4. *"New Interfaces for Cell-free Biosensors to Enable Multiplexed Analyte Detection and Analyte Quantification at the Point of Care."* Award Winner Presentation, Suddath Symposium, Virtual. January 2022.

3. *"The Sweet Solution to Sensing: Repurposing Glucose Monitors to Detect Micronutrient Deficiency and Pathogenic Bacteria."* Selected speaker. Georgia Tech School of Chemical & Biomolecular Engineering 33rd Annual Graduate Research Symposium, Virtual. February 2021.
2. *"Multiplexed Biomarker Detection in Cell-Free System via Aqueous Two-Phase System."* Department seminar, Georgia Tech School of Chemical & Biomolecular Engineering 4th Year Colloquium, Virtual. August 2020.
1. *"Multiplexing Cell-Free Diagnostics via Aqueous Two-Phase System."* Selected speaker. Engineering Biology Research Consortium (EBRC) Annual Meeting, Virtual. April 2020.

Posters

7. *"Portable Glucose Monitor-based Field-Deployable Sensing."* Annual Georgia Tech Research Institute Independent Research and Development (IRAD) Extravaganza, Atlanta, GA. June 2022.
6. *"Protocell Arrays for Simultaneous Detection of Diverse Analytes."* Synthetic Biology: Engineering, Evolution, and Design (SEED), Arlington, VA. May 2022.
5. *"A Sweet Solution to Sensing: Repurposing Personal Glucose Monitors to Detect Diverse Classes of Biomarkers."* Georgia Tech Career, Research, and Innovation Development Conference (CRIDC), Atlanta, GA. January 2022.
4. *"Expanding The Personal Glucose Monitor-Mediated Biosensing Repertoire with Synthetic Biology and Cell-Free Systems."* Engineering Biology Research Consortium (EBRC) Annual Meeting, Virtual. April 2021.
3. *"Cell-Free System in Aqueous Two-Phase Enables Multiplexing of Small Molecule and Nucleic Acids."* Synthetic Biology: Engineering, Evolution, and Design (SEED), New York, NY. June 2019.
2. *"Cell-Free System in Aqueous Two-Phase Enables Multiplexing of Small Molecule and Nucleic Acids."* Engineering Biology Research Consortium (EBRC) Spring Retreat, Boston, MA. February 2019.
1. *"Engineering an RNA-based Negative Autoregulation Circuit."* Synthetic Biology: Engineering, Evolution, and Design (SEED), Chicago, IL. June 2016.

MENTORING EXPERIENCE

2022-23 **Caltech Connection Mentoring and Outreach Program**, *Research mentor*
- Sheung Ho Lam, undergraduate mentee from Pasadena City College

2022-23 **EBRC Mentorship for Undergraduate and Master Students (EMUMS)**, *Mentor*
- Czarlyn Cumba, undergraduate mentee from California State University, Northridge

2018-22 **International Genetically Engineered Machines (iGEM) Competition**, *Mentor*
- Zhejiang University of Technology iGEM team
- University of Maryland iGEM team (*recognized with Most Dedicated Mentor Award*)
- Lambert High School iGEM team

2018-22 **Styczynski Lab**, *Graduate student mentor*
- Vidhya M. Mallikarjunan, ChemE major undergraduate researcher
- Maxwell W. Kazman, ChemE major undergraduate researcher (NSF-GRFP '23)
- Paige L. Steppe, ChemE major undergraduate researcher (NSF-GRFP '22)
- Niya J. Ford, ChemE major undergraduate researcher

TEACHING EXPERIENCE

Georgia Tech*, Graduate teaching assistant*

2022 • ChBE 3200: Transport Phenomenon I (*taught as co-instructor for Tech-to-Teaching capstone*)
2019 • ChBE 4510: Process and Product Design and Economics
2018 • ChBE 2120: Numerical Methods in Chemical Engineering

Cornell University*, Undergraduate teaching assistant*

2017 • CHEME 3320: Analysis of Separation Processes
2016 • CHEME 3130: Chemical Engineering Thermodynamics

SERVICE AND OUTREACH

Caltech

2023
- Summer Undergraduate Research Fellowships (SURF) Seminar Day, *Presentation Judge*

Molecular Programming Society

2022
- Art of Molecular Programming Grass-root Textbook Initiative, *Editor*

Engineering Biology Research Consortium (EBRC)

2022-
- Graduate Student & Postdoc Association (SPA) Board, *Vice President*

2022
- Applying to Graduate Fellowships Virtual Workshop [link], *Panelist*

2021-
- Government and Industry Mentorship Program, *Co-chair*

2021-
- Undergraduate Societies Outreach Initiative, *Co-lead*

2021-22
- Research Roadmap, *Contributor*

International Genetically Engineered Machine (iGEM) Community

2020-
- iGEM Giant Jamboree, *Judge*

Georgia Tech

2018-22
- President's Undergraduate Research Award, *Reviewer*

PROFESSIONAL DEVELOPMENT

2022 Center for the Integration of Research, Teaching, and Learning (CIRTL) Associate Level Certificate

2022 Tech-to-Teaching Certificate in College Teaching, Georgia Tech

2021 Mentorship for the Professoriate Program in Georgia Tech School of Chemical & Biomolecular Engineering