

Sarah M. Coleman, PhD

Austin, TX | Email | GitHub | LinkedIn | Website | Google Scholar

Summary

Biochemical engineer with experience in yeast, bacterial and mammalian systems, bioprocess development, and fermentation-based workflows. Strong computational background in statistical modeling and multi-omics analysis, enabling data-driven optimization of biological systems. Interested in developing and scaling biological processes to solve real-world, high-impact problems through integrated experimental and computational approaches.

Education

The University of Texas at Austin, Austin, TX

Ph.D. in Chemical Engineering, Aug 2024

The University of Texas at Austin, Austin, TX

M.S. in Statistics, May 2024

Massachusetts Institute of Technology, Cambridge, MA

S.B. in Chemical-Biological Engineering, Jun 2019

Technical Skills

- **Molecular & Cellular Biology:** Mammalian and microbial cell culture, CRISPR genome editing, Golden Gate assembly, bacterial and yeast strain engineering, adaptive laboratory evolution, qPCR, flow cytometry, protein expression & purification, Western blotting
- **Bioprocessing & High-Throughput Experimentation:** Batch and fed-batch fermentation, 3 L bioreactors, 96-well plate screening, assay development, high-throughput screening workflows, experimental optimization
- **Computational Biology & Data Science:** Python (pandas, NumPy, scikit-learn), R (tidyverse), SQL, statistical modeling, machine learning, mixed-effects models, experimental design (DoE), reproducible data analysis, multi-omics analysis (RNA-seq, metabolomics, variant analysis), pathway & enrichment analysis
- **Bioinformatics & HPC Workflow Engineering:** RNA-seq processing (QC, alignment, differential expression), omics data workflows, high-performance computing (TACC), containerized bioinformatics pipelines (BioContainers, Docker), version-controlled workflows (Git/GitHub)
- **Analytical Chemistry & Instrumentation:** HPLC, LC-MS, GC-MS, UV-Vis, microscopy, rheology
- **Software, Engineering & Reproducibility Tools:** Linux/Unix, Bash, Git/GitHub, Jupyter, Quarto, LaTeX, workflow automation, computational reproducibility practices

Work Experience

BioReNuva — Austin, TX

Bioprocess Development Engineer | Jun 2026 – Present

- Leading development and optimization of a 7.5L bioreactor fermentation process for rhamnolipid production using attenuated *Pseudomonas aeruginosa* strains
- Establishing production timelines, identifying process bottlenecks, and defining key performance indicators (KPIs) for rhamnolipid synthesis
- Analyzing fermentation data and experimental results to support process characterization, troubleshooting, and continuous improvement initiatives
- Supporting technology transfer activities by developing process documentation, communicating critical process parameters, and facilitating knowledge transfer from development to manufacturing teams

The University of Texas at Austin — Austin, TX

Postdoctoral Research Fellow, Statistics and Data Sciences | Oct 2024 – Present

Research Advisor: Dr. Roger D. Peng

- Developed epidemiological and statistical models quantifying the impact of industrial air pollution mixtures on excess mortality, identifying key sector-level risk drivers
- Modeled behavioral responses to air quality alerts to quantify pedestrian exposure-avoidance behavior under pollution events

- Advised medical faculty on statistical methodology and experimental design in recurring data science workshops
- Authored 2 first-author publications (including one preprint) with another in preparation

Lecturer, Statistics and Data Sciences | Jan 2026 – Apr 2026

- Instructor of record for 100-student upper-division data science course, rated 4.32/5 overall by the students, a higher rating than the Department, College and University averages for Spring 2026
- Built GitHub-based course infrastructure enabling reproducible assignments and scalable grading workflows
- Managed 3 TAs to execute instructional, grading, and student support pipelines

Graduate Student Fellow, Chemical Engineering | Aug 2019 – Aug 2024

Research Advisor: Dr. Hal S. Alper

- Engineered *Yarrowia lipolytica* for enhanced conversion of waste cooking oil into long-chain fatty alcohols, improving lipid hydrolysis and reducing industrial waste buildup
- Integrated CFD modeling with fermentation experiments to characterize and optimize bioreactor performance in high oil density 3L bioreactor systems
- Evaluated the native alkane metabolism of twenty yeasts in or near the *Yarrowia* clade for their potential to biotransform oil substrates
- Evolved *Y. lipolytica* to convert industrial biomass waste into the high-value polyketides triacetic acid lactone and simultaneously reduce COD (Chemical Oxygen Demand)
- Developed CRISPR-based genome editing system using Golden Gate assembly for targeted engineering of *Y. lipolytica*, and used this system to screen a native promoter library
- Proposed and validated a statistical model to quantitatively evaluate the performance of biological Boolean logic gates for the first time
- Authored 11 publications as a graduate student, with 5 at the first or co-first authorship level

MathWorks — Remote (Natick, MA)

MATLAB Student Ambassador | Mar 2020 – Jul 2021

- Delivered technical workshops translating research and engineering workflows into MATLAB-based computational pipelines for academic users
- Demonstrated applied modeling and data analysis workflows, accelerating adoption of reproducible computational methods in research environments

Massachusetts Institute of Technology — Cambridge, MA

Advanced Undergraduate Researcher | Sep 2018 – Aug 2019

Research Advisor: Dr. Michael S. Strano

- Developed a method of nanophosphor size sorting to improve the capacitance of a light emitting plant
- Tested the influence of nanoparticle infiltration on chlorophyll concentration and photosynthetic ability
- Work resulted in second author publication in *Science Advances*

Undergraduate Researcher | Sep 2016 – Aug 2018

Research Advisor: Dr. Gregory Stephanopoulos

- Developed anaerobic assays to characterize the carbon assimilation of *Moorella thermoacetica* enzymes in the Wood-Ljungdahl pathway

Bristol Myers Squibb — Devens, MA

Intern, Upstream Process Development (Biologics) | Jun 2018 – Aug 2018

- Designed and executed metabolite-controlled fed-batch fermentation experiments to systematically evaluate monoclonal antibody production performance
- Analyzed upstream bioprocess data to identify conditions that improved yield stability and process robustness in biologics production
- Supported experimental iteration cycles for process optimization in a regulated biomanufacturing environment

Takeda Pharmaceuticals — Cambridge, MA

Intern, Process Development (Vaccines) | May 2017 – Aug 2017

- Optimized mammalian cell culture conditions to improve vaccine production performance within a next-generation manufacturing system
- Contributed to experimental design and process optimization workflows focused on improving scalability and production efficiency of biologics

Girl's Angle Math Club — Cambridge, MA

Math Mentor | Sep 2016 – Apr 2018

- Mentored students weekly in advanced mathematical reasoning with emphasis on structured problem-solving and analytical rigor

Select Honors and Awards

- **First Place, Professional Division — Data Challenge Expo, JSM (Joint Statistical Meetings)**, 2025
Recognized for data-driven problem solving in a competitive national data science setting
- **National Science Foundation Graduate Research Fellowship (NSF GRFP)**, 2021

Prestigious national fellowship awarded for demonstrated research excellence in science

- **Provost’s Graduate Excellence Fellowship, UT Austin, 2019**
Competitive institutional fellowship awarded for outstanding incoming graduate students
- **Individual Accomplishment Citation, MIT Department of Chemical Engineering, 2018 & 2019**
Only known undergraduate to win this award two years in a row, for academic and volunteer accomplishments

Peer-Reviewed Publications

In reverse chronological order. An asterisk (*) indicates co-first authorship.

1. Partipilo, G.*, **Coleman, S. M.***, Holwerda, A. J., Gao, Y., Mahfoud, I. E. M., Wilke, C. O., Alper, H. S., & Keitz, B. K. (2026). A Linear Mixed Effects Model for Evaluating Synthetic Gene Circuits. *ACS Synthetic Biology*. <https://doi.org/10.1021/acssynbio.6c00171>
2. **Coleman, S. M.**, & Peng, R. D. (2026). Do ozone action day alerts modulate active transportation in Texas cities? *Environmental Research Communications*. <https://doi.org/10.1088/2515-7620/ae2e99>
3. Gordillo Sierra, A. R., Yook, S., **Coleman, S.**, Bansal, M., & Alper, H. S. (2025). Developing a *Yarrowia lipolytica* platform for conversion of mannitol-containing waste streams. *Bioresource Technology*, 133161. <https://doi.org/10.1016/j.biortech.2025.133161>
4. Qin, J., Liu, N., Abid, U., **Coleman, S. M.**, Wang, Y., Fu, Q., Yoon, S., Alper, H. S., & Xie, D. (2025). Metabolic Engineering of *Yarrowia lipolytica* for Conversion of Waste Cooking Oil into Omega-3 Eicosapentaenoic Acid. *ACS Engineering Au*, 5(2), 128–139. <https://doi.org/10.1021/acseengineeringau.4c00053>
5. **Coleman, S. M.***, Marx, R. J.*, Martinez, M. K., Silvera, A. J., Park, J., Ramanan, E., Kaown, G., Yoon, S., Xie, D., & Alper, H. S. (2024). Considerations Regarding High Oil Density Bioreactor-Scale Fermentations of *Yarrowia lipolytica* Using CFD Modeling and Experimental Validation. *Biotechnology Journal*, 19(12), e202400506. <https://doi.org/10.1002/biot.202400506>
6. Presnell, K. V., Melhem, O., **Coleman, S. M.**, Morse, N. J., & Alper, H. S. (2024). Design and synthesis of synthetic promoters for consistency of gene expression across growth phases and scale in *S. cerevisiae*. *Synthetic and Systems Biotechnology*. <https://doi.org/10.1016/j.synbio.2024.03.004>
7. Marsan, C. B., Lee, S. G., Nguyen, A., Sierra, A. R. G., **Coleman, S. M.**, Brooks, S. M., & Alper, H. S. (2024). Leveraging a *Y. lipolytica* naringenin chassis for biosynthesis of apigenin and associated glucoside. *Metabolic Engineering*, 83, 1–11. <https://doi.org/10.1016/j.ymben.2024.02.018>
8. Graham, A. J., Partipilo, G., Dundas, C. M., Miniell Mahfoud, I. E., Halwachs, K. N., Holwerda, A. J., Simmons, T. R., FitzSimons, T. M., **Coleman, S. M.**, Rinehart, R., Chiu, D., Tyndall, A. E., Sajbel, K. C., Rosales, A. M., & Keitz, B. K. (2024). Transcriptional regulation of living materials via extracellular electron transfer. *Nature Chemical Biology*, 1–12. <https://doi.org/10.1038/s41589-024-01628-y>
9. **Coleman, S. M.***, Cordova, L. T.*, Lad, B. C., Ali, S. A., Ramanan, E., Collett, J. R., & Alper, H. S. (2023). Evolving tolerance of *Yarrowia lipolytica* to hydrothermal liquefaction aqueous phase waste. *Applied Microbiology and Biotechnology*. <https://doi.org/10.1007/s00253-023-12393-8>
10. Soong, Y.-H. V.*, **Coleman, S. M.***, Liu, N., Qin, J., Lawton, C., Alper, H. S., & Xie, D. (2023). Using oils and fats to replace sugars as feedstocks for biomanufacturing: Challenges and opportunities for the yeast *Yarrowia lipolytica*. *Biotechnology Advances*, 108128. <https://doi.org/10.1016/j.biotechadv.2023.108128>
11. Yuan, S.-F., Nair, P. H., Borbon, D., **Coleman, S. M.**, Fan, P.-H., Lin, W.-L., & Alper, H. S. (2022). Metabolic engineering of *E. coli* for L-alanine production using a multi-biosensor enabled approach. *Metabolic Engineering*. <https://doi.org/10.1016/j.ymben.2022.08.012>
12. Lad, B. C.*, **Coleman, S. M.***, & Alper, H. S. (2021). Microbial valorization of underutilized and nonconventional waste streams. *Journal of Industrial Microbiology and Biotechnology*. <https://doi.org/10.1093/jimb/kuab056>
13. Gordiichuk, P., **Coleman, S.**, Zhang, G., Kuehne, M., Lew, T. T. S., Park, M., Cui, J., Brooks, A. M., Hudson, K., Graziano, A. M., Marshall, D. J. M., Karsan, Z., Kennedy, S., & Strano, M. S. (2021). Augmenting the living plant mesophyll into a photonic capacitor. *Science Advances*, 7(37), eabe9733. <https://doi.org/10.1126/sciadv.abe9733>

Preprints/In Preparation

1. **Coleman, S. M.**, Zhang, H. S., Lucchesi, L. R., & Roy, S. (2026). Exploring the periodicity of flight patterns. *arXiv*. <https://doi.org/10.48550/arXiv.2606.00128>
2. Martinez, M. K.*, **Coleman, S. M.***, Marter, C., Vinod, N., Subramanian, A., & Alper, H. S. Alkane metabolism of yeasts in the *Yarrowia* clade.