

Eric J. South

ericjohnsouth@gmail.com | Boston, MA | ericsouth.com
LinkedIn | GitHub | Google Scholar | Substack | Bluesky | X

Summary

Systems, synthetic, and computational biologist combining laboratory assays, bioinformatics, machine learning, and open-source software development to design biological sequences and evaluate their function, drawing on experience in genetic circuit design, protein engineering, and high-throughput screening.

Technical Skills

- **Experimental Biology:** Experimental design and assay development; genetic circuit and biosensor design; DNA assembly, cloning, transformation, and conjugation; bacterial, yeast, and mammalian cell culture; protein purification; automated liquid handling; flow cytometry and plate-reader assays; ELISA and Western blotting; amplicon sequencing (NGS); anaerobic gas fermentation
- **Computational Biology:** Regulatory DNA design; structure-guided protein design (ProteinMPNN); transcription-factor binding-site design; genetic-circuit modeling; active learning for experimental selection; latent-space analysis of sequence representations (Evo2); RNA–protein structural analysis
- **Scientific Software & Data:** Python, R, shell scripting, and Git; package and API/CLI development; experimental data ingestion, validation, and analysis pipelines; dependency and environment management (uv, pixi); automated testing, linting, and CI (GitHub Actions); agent tooling and workflow automation

Research Experience

Boston University, Dunlop Lab / Biological Design Center

Sept. 2020 — Present

PhD Research

- Developed a [dense-array algorithm](#) to compile transcription-factor binding sites into synthetic promoters; integrated foundation-model representations and experimental feedback in a closed-loop active learning pipeline to target distinct gene-expression responses across conditions.
- Engineered modular scientific software for [DNA design and assembly](#), [multi-motif sequence optimization](#), [computational hairpin construction planning](#), and [experimental data integration and analysis](#).
- Combined structure-guided reverse-transcriptase design, engineered retron lncRNAs, and functional assays to investigate intracellular gene regulation.

LanzaTech, Synthetic Biology & Host Strain Engineering Team

Summer 2022 — Fall 2022

Engineering Biology Research Consortium Intern

- Contributed genetic tools for gas-fermenting strains through pooled DNA-library design, massively parallel reporter assays, next-generation sequencing, and biosensor development.

Imperial College London / The Francis Crick Institute

2018 — 2020

MRes Student / Postgraduate Researcher

- Implemented a high-throughput workflow using laboratory robotics to screen hundreds of yeast cultures in parallel and identify metabolic cross-feeding communities.

SRI International, Center for Macromolecular Bioscience

2017 — 2018

Student Associate

- Analyzed peptide drug-candidate binding and internalization in mammalian cell lines using flow cytometry and Western blotting to support tissue-specific cancer drug delivery; also supervised two interns.

James Madison University, School of Integrated Sciences

2014 — 2017

REU Undergraduate Researcher

- Purified ubiquitin-like proteins from *E. coli* using size-exclusion and ion-exchange chromatography to support biochemical characterization of the human Uba1 enzyme.

Education

Boston University, Boston, Massachusetts, USA

Started Sept. 2020

PhD Candidate - Molecular Biology, Cell Biology, and Biochemistry (MCBB)

Advisors: Mary J. Dunlop

Thesis: "Molecular Sequence Design for Cellular Gene Regulation"

Imperial College London, London, England, UK

Sept. 2018 — Sept. 2019

Master of Research - Systems & Synthetic Biology; Graduated first in class

Advisors: Rodrigo Ledesma-Amaro, Markus Ralser

Thesis: "A Screening Platform to Identify Synthetic Microbial Communities"

James Madison University, Harrisonburg, Virginia, USA

May 2018

Bachelor of Science - Biotechnology; GPA: 3.72; Magna Cum Laude

Publications

Eric J. South, Mary J. Dunlop. 2026. Manuscripts in preparation

- **Specification-driven experimental search for multistate promoter behavior**
- **Balanced inverse design of fixed-length DNA sequences from multiple motif models**
- **Designing oligonucleotide processing routes for DNA hairpin construction**

Generating information-dense promoter sequences with optimal string packing

Virgile Andreani*, **Eric J. South***, Mary J. Dunlop; [***Co-first**]. PLoS Comput Biol (2024), 20(7): e1012276

A molecular toolkit of cross-feeding strains for engineering synthetic yeast communities

Huadong Peng, Alexander P. S. Darlington, **Eric J. South**, Hao-Hong Chen, Wei Jiang, Rodrigo Ledesma Amaro. Nat Microbiol (2024), 9: 848–863

Spontaneously established syntrophic yeast communities improve bioproduction

Simran Aulakh*, Lara Sellés Vidal*, **Eric J. South***, Sreejith Varma, Lucia Herrera Dominguez, Huadong Peng, Markus Ralser, Rodrigo Ledesma-Amaro; [***Co-first**]. Nat Chem Biol (2023), 19(8): 951–961

Transcriptional Tuning of Mevalonate Pathway Enzymes to Identify the Impact on Limonene Production in *Escherichia coli*

Jonghyeon Shin*, **Eric J. South***, Mary J. Dunlop; [***Co-first**]. ACS Omega (2022), 7(22): 18331–18338

Teaching, Mentoring & Leadership

- **Teaching Fellow**, BU BE 209: Molecular Cell Biology & Biotechnology (Fall 2023) | 39 students | evaluation 4.53/5.00; (Spring 2021) | 45 students | evaluation 4.92/5.00
- **Chair & Organizer**, Gordon Research Seminar: Synthetic Biology (2027): PhD/postdoc meeting
- **BU mentoring**: Mentored three graduate rotation students individually (2022–Present); Supervised five BME undergraduates developing a CNN image-processing pipeline for microbial viability assays.
- **Mentorship Organizer**, BU BDC (2022–2024): Linked dozens of PhD mentees and biotech mentors.
- **Industry Liaison**, EBRC (2021–2023): Organized biotech business and data-infrastructure panels.
- **Outreach Manager**, Science Entrepreneur Club (2018–2019): Co-organized a biotech startup pitch competition with Merck Accelerator.
- **President**, JMU Student Biotechnology Association (2017–2018): Planned an eight-month program with six facility tours, six guest speakers, and five networking events.

Presentations, Training & Honors

- **Posters**: Gordon Research Conferences—Synthetic Biology (2023, 2025) and Microbial Stress Response (2024); BU BDC Symposium (2023); SEED (2022)
- SynbiCITE 4-Day MBA, Imperial College Incubator, **Entrepreneurship and pitching workshop** (2018)
- **NIH T32 Trainee in Synthetic Biology & Biotechnology**, Boston University (2021–2026)
- **Excellence in Biotechnology Leadership Award**, JMU (2018): Was recognized for student-organization work, program marketing, and peer instruction.