

Report to the President for year ended June 30, 2025, Department of Biological Engineering

Graduate Education

Our current enrollment is 131 graduate students, predominantly in the PhD program. The department graduated 34 PhD students for the AY2025 academic year. Our graduate student population represents women and men in roughly equal numbers. 12% of our graduate students are from underrepresented populations. Our AY2025 application cycle had a 2% admittance rate. We had to reduce the number of incoming students by 50% due to pressure on the number of spaces in labs as a result of federal funding cuts and associated uncertainty. 65% of our students that we admitted decided to come to the program. The Department is proud of the leadership of our graduate students, both while at MIT and after they graduate and help to grow the field through innovation and impact. This impact is shown through the many Institutional awards they have won, the leadership they show when they graduate, and the accolades they receive in their careers.

Undergraduate Education

We had 36 graduating seniors in AY2025 and hosted approximately 37 seniors, 42 juniors, and 34 sophomores for AY2025. Our undergraduate class is comprised of 71% women and 30% underrepresented students. Our Biological Engineering curriculum is unique because it is centered on molecules, cells, and tissue as its science foundation. This science is fused with quantitative, systems design-oriented engineering principles and approaches (e.g., thermodynamics, kinetics, mechanics, transport, computation), including two hands-on laboratory subjects (genetic engineering and instrumentation). Our uniquely-educated Course 20 students continue to find attractive career opportunities across a spectrum of industrial, academic, and professional areas. We also administer an SB minor program in biomedical engineering (BME). In addition, we administer a five-year MEng program in a biomedical engineering, bioengineering track.

Research

During fiscal year 2025, total amount of sponsored research volume supervised by BE faculty members was approximately \$78 million. This figure includes sponsored projects formally administered by the department (more than \$34 million), as well as projects directed by BE faculty members supervised administratively within other departments and centers, including but not limited to the Center for Biomedical Engineering, Center for Environmental Health Sciences, Computational & Systems Biology Initiative, Division of Comparative Medicine, Institute for Medical Engineering and Science, and Koch Institute.

Major research areas within BE include biomaterials; biomolecular engineering; cell and tissue engineering; computational biology and bioinformatics; discovery, design, and delivery of molecular therapeutics; molecular and cellular biophysics; infectious disease and immunology; microbial ecosystems; neurobiology and neuroengineering; molecular epidemiology; molecular toxicology; agriculture and climate change; plant engineering; bio-manufacturing; bio-mining, and synthetic biology.

Center for Environmental Health Sciences

Human health is dependent on our relationship with the environment. The mission of the Center for Environmental Health Sciences (CEHS) is to predict and elucidate the ways that chemical and biological agents in the environment affect human health, as well as the health of the ecosystem that supports all life. In addition to identifying toxic chemicals and hazardous organisms in our environment, CEHS research develops methods to detect them, delineates the mechanisms through which these agents affect health at the cellular, tissue, individual or population levels, and helps to create new technologies that allow us to live longer and healthier lives.

CEHS has served as a nucleation point for a diverse group of environmental scientists, engineers and policy experts from eleven departments across the Institute to focus on domestic and global environmental threats ranging from industrial pollution to infectious agents. CEHS complements its talented human resource pool with state-of-the-art technologies to enable progress on high-impact problems that could not be realistically tackled by an individual laboratory. In this way, CEHS has enabled synergistic partnerships of people and technologies towards solutions for important environmental problems. In recent years, the climate, environment and health research and funding landscapes have rapidly and substantially evolved within MIT and externally. Several new on-campus initiatives, such as the Climate Project and Climate Grand Challenges, are well underway and have galvanized campus-wide collaborative research activities. In parallel, external funding sources, such as a National Institute of Environmental Health Sciences (NIEHS) P30 Core Center grant that provided support for key CEHS staff and critical research activities, were not successfully renewed. These changes prompted the need to consider repositioning CEHS, which had previously been generously supported by and directly reported to the VPR. This process resulted in consolidation of CEHS under the Department of Biological Engineering, which has deep historical roots and ongoing priorities in environmental and human health research activities that are well aligned with those of CEHS. Indeed, more than half of CEHS members are Biological Engineering faculty, and the department supports both a NIEHS P42 Superfund Research Grant and a T32 Training Grant in Toxicology and Environmental Health.

Resource Development

Biological Engineering had an exceptional fundraising year in FY25, with \$21,363,297 in new gifts and pledges, representing a 228% increase over FY24. Of note, the department received several generous gifts in support of research, including menstruation science, gynepathology, and agriculture. The department will continue to prioritize building its fundraising pipeline in collaboration with Resource Development, the Alumni Association, and other campus partners.

Angela Koehler and Bryan Bryson Faculty Promotions

Dr. Angela Koehler's Full Professor promotion case was presented to Engineering and Academic councils in AY2025 with a start date of July 1, 2025. Angela joined the faculty at the start of 2012. Angela Koehler is a Professor in the Department of Biological Engineering at MIT and Associate Director of the Koch Institute for Integrative Cancer Research. She is also an Institute Member of the Broad Institute, a Founding Member of the MIT Center for Precision Cancer Medicine, and Faculty Director of MIT HEALS, which fosters cross-disciplinary research to advance human health. Her research focuses on developing small-molecule probes for emerging patient-based genomics targets. Angela received her B.A. in Biochemistry and Molecular Biology from Reed College in 1997 and her Ph.D. in Chemistry from Harvard in 2003. She then became an Institute Fellow at the Broad Institute. At MIT, she teaches courses on biological engineering, biotechnology, and business. She has received numerous awards, including the Genome Technology Young Investigator and the Novartis Lectureship in Chemistry, and serves on several scientific advisory boards. Angela has founded biotechnology companies such as Ligon Discovery, Kronos Bio, and 76Bio (acquired by Axelyf).

Dr. Bryan Bryson's Associate Professor with tenure promotion case was presented to Engineering and Academic councils in AY2025 with a start date of July 1, 2025. Professor Bryson is the Phillip and Susan Ragon Career Development Professor in the Department of Biological Engineering, conducts research in infectious diseases and immunoengineering. He is interested in developing new tools to dissect the complex dynamics of bacterial infection at a variety of scales ranging from single cells to infected animals, sitting in both "reference frames" by taking both an immunologist's and a microbiologist's perspective.

New Faculty Hiring – Eric Sun and Zhiliang Bai

Dr. Eric Sun obtained an A.B. in Chemistry and Physics and S.M. in Applied Mathematics from Harvard University in 2020. He completed his Ph.D. in Biomedical Informatics at Stanford University in 2025 under the joint supervision of Professors Anne Brunet and James Zou, where his research involved building computational methods for the analysis of spatial and single-cell omics and machine learning tools to track cellular aging in the brain. Eric joins MIT as an Assistant Professor of Biological Engineering in early 2026, where his lab develops computational and artificial intelligence / machine learning tools to decode the biology of aging across multiple scales.

Dr. Zhiliang Bai is an incoming Assistant Professor in the Department of Biological Engineering (early 2026) at MIT and an intramural member of the Koch Institute for Integrative Cancer Research. He earned his Ph.D. in Instrument Science and Technology from Tianjin University in China and completed his postdoctoral research training with Prof. Rong Fan in the Department of Biomedical Engineering at Yale University. His expertise lies in microfluidic device engineering, cancer immunotherapy and spatial omics technology development. His most significant contributions to science and technology include uncovering the critical role of type-2 immunity in sustaining long-term durable immunotherapy and developing Patho-DBiT, a first-of-its-kind technology that enables the

exploration of rich RNA biology in clinically-archived FFPE tissues. Dr. Bai has received several accolades, including the Joan and Tom Steitz RNA Fellow, SITC Young Investigator Award, FOCIS Clinical Immunology Award, BMES-CMBE Postdoctoral Researcher Award, ASH Abstract Achievement Award, and the Committee of 100 Leadership Scholarship. Beyond the lab, he is passionate about hosting community events, engaging in fitness challenges, and fostering growth through teaching and mentorship.

BE Career Expo

The 11th Annual BE Career Expo was held at MIT in October 2024, attracting 18 companies. A total of 247 undergraduates, graduate students, and postdocs attended, interacting with representatives from a range of sectors such as biotech/life sciences, pharmaceuticals, consulting, communications, law and intellectual property, and manufacturing. This event offered students valuable opportunities to explore career options and connect with potential employers. Notably, 18% of attendees were first-year undergraduates. Participants came from various departments, including Biological Engineering (BE), Chemical Engineering, Materials Science and Engineering, Electrical Engineering and Computer Science, Mechanical Engineering, Biology, and Chemistry.

BE Departmental Retreat

The BE Department Retreat was held at Hotel Commonwealth in October and featured poster presentations and a community gathering. Speakers included members of our graduate student and postdoctoral cohorts. Our keynote speaker was Andrea Califano, PhD, the Clyde and Helen Wu Professor of Chemical and Systems Biology at Columbia University Irving Medical Center. He also holds appointments in the Departments of Biochemistry & Molecular Biophysics, Biomedical Informatics, and Medicine. Dr. Califano was recently named President of the Chan Zuckerberg Biohub New York.

This was our final full retreat, as we transition to a new format: a large retreat every other year, alternating with a smaller event featuring poster sessions and lightning talks in the off years.

BE Community Report

Academic year 2024-2025 marked a renewed focus and commitment on *community* by the BE department. In the more decentralized and accountable organization of BE leadership established by department head Prof. Christopher Voigt, community building has an explicit role to play in most BE pursuits, from recruiting and welcoming a broad range of BE trainees, to offering professional development activities, to bringing all stakeholders' voices to curriculum updates.

Additionally, in, the newly formed BE Community Committee (Prof. Bryan Bryson, Prof. Jongyoon Han, and Dr. Maxine Jonas) organized MIT faculty community building informal gatherings and monthly BE "happy hours". The former were funded by a seed grant from the MIT offices of the President, Provost, and Vice Provost for Faculty and brought together MIT faculty and instructors from across a dozen departments at the intersection of engineering

and life sciences, to discuss how biology could be a major contributor to The Climate Project at MIT, curricular innovations, or co-authoring grants. The BE happy hours started in May 2024 and continue monthly to this day. A different research group takes the lead each month in offering a themed event that brings together BE students, postdocs, staff and faculty: the entire BE community. Through them, BE members have enjoyed crafts, foods of the world, fitness classes, and “The Humans Behind the Research” personal stories, all contributing to making BE a vibrant, supportive, creative, and caring community.

Department Awards

American Institute of Chemical Engineers (AIChE) James E. Bailey Award
K. Dane Wittrup (2024)

BMES Robert A. Pritzker Distinguished Lectureship Award
Prof Linda Griffith (2025)

Earl M. Murman Award for Excellence in Undergraduate Advising
Prof Doug Lauffenburger (2025)

Ellen J. Mandigo Award for Outstanding Service–MIT School of Engineering
Gerri Powers (2025)

Harold E. Edgerton Faculty Achievement Award
Prof Anders Hansen (2025)

Institute of Electrical and Electronics Engineers (IEEE) Medal for Innovations in Healthcare Technology
Prof James J. Collins (2025)

National Institutes of Health Director’s Transformative Research Award
Prof Anders Hansen (2024)

National Medal of Science
Prof Angela Belcher (2024)

National Medal of Technology and Innovation
Prof Feng Zhang (2024)

Stephen Hawking Medal Junior
Gitanjali Rao, Class of 2027 (2025)