

Department of Biology

Academic year 2019 was an exciting and productive one for the [Department of Biology](#). The department continues to be considered one of the best biological science departments in the world. Its faculty members are leaders in biological research and education and its students are among the best. Highlights of the department's faculty, research, and educational programs appear below.

Faculty Count, Promotions, and Departures

During AY2019, the Department of Biology had 58 primary faculty members: 43 full professors, six associate professors, and nine assistant professors. Research facilities were distributed between the Koch Biology Building (Building 68), the Broad Institute of MIT and Harvard, the Koch Institute for Integrative Cancer Research, the Picower Institute for Learning and Memory, and the Whitehead Institute for Biomedical Research.

An additional five faculty members held secondary appointments in Biology. These joint faculty members provided important connections with other departments, including Brain and Cognitive Sciences, Biological Engineering, and Civil and Environmental Engineering.

Professor Adam Martin became associate professor with tenure. The department welcomed Ankur Jain as a new assistant professor and Bruce Walker as a professor of the practice. Professor Dennis Kim moved to Boston Children's Hospital as chief of the Division of Infectious Diseases. Professors Terry Orr-Weaver (Biology and Whitehead Institute) and Martha Constantine-Paton (Biology and Brain and Cognitive Sciences) retired.

Faculty Awards

The department's faculty members are widely recognized for their contributions to the field. The current faculty includes three Nobel laureates, 24 members of the National Academy of Sciences, 21 members of the American Academy of Arts and Sciences, 11 fellows of the American Association for the Advancement of Science, four recipients of the National Medal of Science, and 14 Howard Hughes Medical Institute Investigators. Here are just a few recent honors and awards given to Biology faculty members:

- Angelika Amon received the Breakthrough Prize in Life Sciences, 2019; the Vilcek Prize, 2019; and the Vanderbilt Prize in Medical Science, 2018.
- Sallie (Penny) Chisholm received the Crafoord Prize, 2019.
- Joseph (Joey) Davis was appointed to the Whitehead Career Development Chair, beginning July 2019.
- Gene-Wei Li received a National Science Foundation Faculty Early Career Development Award, 2019.
- Sebastian Lourido was appointed to the Latham Family Career Development Professorship, beginning July 2019.
- Aviv Regev was elected to the National Academy of Sciences.

- David Sabatini received the Switzer Prize, 2018.
- Hazel Sive was awarded a 2019 MIT Teaching Prize for Graduate and Undergraduate Education.
- Michael Yaffe received the MIT Teaching with Digital Technology Award, 2018.
- Ömer Yilmaz was a recipient of the Martin and Rose Wachtel Cancer Research Award, 2018, from the American Association for the Advancement of Science.

Research Highlights

Biology Department faculty members continue to make major research contributions to the life sciences. Research areas include genetic information within cells and how it is decoded; the structure and function of the cellular machineries needed for normal growth and propagation; how normal cellular processes work and what goes wrong in disease (cancer, neurodegeneration, infection, and so on); how cells differentiate to adopt new fates and functions; how microbes function and interact with each other and larger organisms to be beneficial or to cause disease; how cells process and respond to external and internal signals; how evolution shaped fundamental biological processes; and what controls aging and regeneration.

The research projects of those faculty members who completed the promotion process in academic year 2019 are described briefly below.

Mary Gehring successfully completed the tenure review process. Gehring's work focuses on plant epigenetics—that is, the heritable information that influences cellular function but is not encoded in the DNA sequence itself. Gehring's laboratory uses genetic, genomic, and molecular biology approaches to study the fidelity of epigenetic inheritance and the dynamics of epigenomic reprogramming during reproduction, primarily in the model plant *Arabidopsis thaliana*.

Jing-Ke Weng was promoted to associate professor without tenure. His laboratory probes the origin and evolution of plant metabolism, as well as how plants exploit discrete small molecules to interact with their surrounding environments. Researchers also use natural plant products with specific medicinal properties as chemical probes to query human disorders such as metabolic syndromes and protein-misfolding diseases. Ultimately, they hope to elucidate the molecular mechanisms underlying the so-called matrix effect evident in many traditional herbal remedies.

Ömer Yilmaz was promoted to associate professor without tenure. Yilmaz's laboratory investigates the molecular mechanisms of how intestinal stem cells and their Paneth cell niche respond to diverse diets to coordinate intestinal regeneration with organismal physiology and its impact on the formation and growth of intestinal cancers. By understanding how intestinal stem cells adapt to diverse diets, they hope to identify and develop new strategies to prevent and reduce the growth of cancers involving the intestinal tract that includes the small intestine, colon, and rectum.

Education

Fifth-week enrollment data for AY2019 showed 59 undergraduates registered as regular Biology majors. There were also 16 students with double majors, 65 students majoring in Course 6-7 Computer Science and Molecular Biology, and 34 students majoring in Course 5-7 Chemistry and Biology, for a total of 174 students.

There were 222 graduate students registered in the Biology Department's graduate program and 32 in the interdepartmental Microbiology graduate program. The Joint Woods Hole Oceanographic Institute (WHOI) Program had 10 students, for a total of 264.

In AY2019, the department awarded the bachelor of science degree to 77 students, including 12 in Biology, 22 in Computer Science and Molecular Biology, 14 in Chemistry and Biology, and 19 students who had double majors. The department awarded one master of science degree, in the Computer Science and Molecular Biology program.

Doctoral degrees were awarded to 38 students, including 33 in Biology, three in the interdepartmental Microbiology graduate program, and two in the Joint Program in Biological Oceanography with WHOI.

The department is proud of its long-standing focus on excellence in both undergraduate and graduate education. Faculty members are committed to playing an active role in teaching, advising, and mentoring students. The department encourages and supports the continued review and development of new and existing subjects to keep up with the rapid pace of discovery in the life sciences and to adapt to the needs and capabilities of its students.

Online Education Initiatives

Promoting evidence-based teaching practices via online and hybrid education continues to be a priority for the [MITx Biology](#) team, both in building massive open online courses on the edX platform (available to learners around the world) and in developing materials specifically for use on campus using MITx, an iteration of the edX platform. The MITx Biology subjects on edX have had an impressive reach; 7.05x Biochemistry was added this past year. On campus, the department continues to expand blended-learning initiatives (digital and in-person teaching and learning) by integrating MITx websites into subjects. The MITx websites host the digital learning materials as assignments or additional resources that in turn influence the in-person learning experience. The team has worked with more than 17 Biology faculty members over the years and has advised others outside the department.

Student Awards

The department takes great pride in the success and productivity of its students, many of whom received recognition in academic year 2019.

External Undergraduate Awards

Anna Sappington was awarded the Marshall Scholarship, a postgraduate scholarship for intellectually distinguished young Americans to study at any university in the United Kingdom.

Meenakshi Chakraborty was named a Churchill Scholar, a competitive program that provides funding to American students for a year of master's degree study at the University of Cambridge, UK, based at Churchill College.

Catherine Wu received a Fulbright Student Fellowship Program Award, which will fund her work with university students in Brazil as an English teaching assistant.

MIT Undergraduate Awards

Fourteen Biology majors from the class of 2019 were elected to Phi Beta Kappa. They are Min Woo Bae (Course 5-7), Amanda Cao (Course 7), Meenakshi Chakraborty (Course 6-7), Run Chen (Course 6-7), Erika Ding (Course 7A), Kimberly Feng (Course 7), Jeewoo Kang (Course 7A), Chung-Yueh Lin (Course 6-7), Janice Ong (Course 7A) Priya Pillai (Course 6-7), Helen Sakharova (Course 6-7), Sarah Stern (Course 7), Clare Wieland (Course 7A), and Yan Zhang (Course 5-7).

Department of Biology Undergraduate Awards

- Anna Sappington received the Salvador E. Luria Prize for scholarship and research of publication quality.
- Maia Mesyngier was awarded the Susan Hockfield Prize in Life Sciences for a third-year MIT undergraduate student in any area of the life sciences who has demonstrated both exceptional performance and promise for graduate study and research.
- Eleanor Wintersteen and Joseph Espiritu were given the Gene Brown Prize for academic scholarship and demonstrated excellence as a teaching assistant.
- Aman Patel received the Merck Prize for outstanding research and academic performance in biophysical or bioinformatics science.
- Apolonia Gardner was awarded the Whitehead Prize for outstanding promise for a career in biological research through academic scholarship as well as contributions to research and the MIT community.
- Meenakshi Chakraborty received the Ned Holt Prize for demonstrated excellence in scholarship and service to the MIT community.
- Sarah Stern, Muskaan Aggarwal, and Madeleine Kline were awarded the John L. Asinari Award for outstanding research in the field of life sciences.

Chemistry and Biology Undergraduate Awards

- Min Woo Bae received the Alpha Chi Sigma Award for outstanding achievement in scholarship, research, and service to the Department of Chemistry.
- Elizabeth Brewer and Catherine Williamson were given the Department of Chemistry Research Award for outstanding contributions in the area of research.
- Grayson Rodriguez and Yue Zhang both received the Royal Society of Chemistry Certificate of Excellence for outstanding scholarship.

Department of Biology Graduate Student Awards

- Elena Kingston received the Teresa Keng Graduate Teaching Prize for outstanding dedication and commitment to teaching.
- Sheena Vasquez and Kwadwo Owusu-Boaitey were given the Gene Brown-Merck Teaching Award for outstanding dedication and commitment to teaching.
- Neha Bokil, Jaclyn Camuglia, Sebastian Coupe, Juhee Park Morehouse, Deepshikha Dogra, Summer Morrill, Grace Johnson, James Taggart, and Ellen Zhong were awarded the recognition of Teaching Assistant Honorable Mention.
- Greg Wyant received the Weintraub Graduate Student Award.

Undergraduate Research Program

Eight students spoke in the Undergraduate Research Symposium at the invitation of their research faculty mentors. Speakers included Muskaan Aggarwal, Apolonia Gardner, Ameena Iqbal, Hannah Jacobs, Chun-Ting Liu, Leah McKinney, Tee Udomlumleart, and Daiyao Zhang.

Diversity and Outreach

A strategic objective of the Biology Department is to increase the number of students from underrepresented minority groups pursuing research careers. A primary, but not the sole, focus of the department's efforts is to increase enrollment of such students in its graduate programs. To this end, the department continued to engage in a variety of outreach activities and programs for undergraduates who are not at MIT, high-school students, and high-school teachers during AY2019. Two programs in particular serve as robust pipelines for the identification and development of students with more diverse backgrounds:

- [MIT Summer Research Program Biology \(MSRP-Bio\)](#)— This program is designed to encourage underprivileged students and those from underrepresented minority groups to pursue careers in the sciences. Students spent 10 weeks conducting full-time supervised research and participated in activities specifically designed to prepare them for graduate-level classes.
- [Quantitative Methods Workshop](#)— This one-week workshop brought students and faculty from historically black colleges and universities, such as Spelman College and Howard University, and minority-serving institutions from Puerto Rico and Florida, to MIT during Independent Activities Period. This intensive, fast-paced workshop exposed participants to quantitative and computational tools required to analyze large biological data sets or to model biological phenomenon.

These two programs, and the department's emphasis on personal contact and long-term regular interactions with faculty who mentor students from underrepresented minority groups, have proven to be a very effective recruitment strategy. More than 50% of the department's current roster of graduate students from underrepresented minorities participated in at least one of the following MIT programs: MSRP-Bio, the Quantitative Methods Workshop, or CONVERGE (a four-day graduate school preview weekend sponsored by the Office of Graduate Education).

There are additional outreach programs overseen by the department on the MIT campus, or at one of its other research locations, that welcome either undergraduates or younger students and their teachers. These programs are designed in the hope of increasing the diversity of students in the sciences, technology, engineering, and mathematics, increasing public awareness of biological and biomedical research, or both. Many members of the Department of Biology participated in these programs during AY2019. These programs included [summer workshops for teachers](#), [MIT field trips](#), the [LEAH Knox Scholars Program](#) (for area high-school students); the [Whitehead Institute Seminar Series for High-School Teachers](#), the [Whitehead Spring Lecture Series for High-School Students](#), the [Whitehead Summer Science Program for Middle-School Students](#) (Expedition: Bio); the [Koch Institute Student Outreach Program](#), the [Koch Institute's with/in/sight Public Lecture Series](#); and the [Broad Summer Research Program](#), [Broad Summer Scholars Program](#), [Broad Institute Middle School Program](#), and [Broad Institute public lectures](#).

Development

Fiscal year 2019 saw new records set in participation and discretionary support for the department, but the department still has significant goals and needs. Biology's top priorities remain attracting the best graduate students, recruiting and retaining top faculty members, building a pipeline of young students participating in biological research, and remaining flexible in funding to enable new initiatives and research to thrive. Discretionary funding and support for Biology's graduate program remain the department's top two development priorities.

Graduate students are at the core of the research and educational mission of the department and adequate funding for the graduate program is one of the most important challenges. With the help of MIT alumnus, former faculty member, and Visiting Committee member Paul Schimmel, the department continues to approach alumni and other friends of the department to ask for their help. Through coordination with Planned Giving staff, the Office of the General Counsel, the Office of the President, the Office of the Provost, the Dean of the School of Science, and several others, Biology secured the largest planned gift in the department's history in the form of a \$50 million planned gift. Although these funds will not be available to the department for many years, they will ultimately support the Biology Department's graduate program and help ensure its future. The department continues to work diligently to secure funds that will support its graduate students in the near term.

The MSRP-Bio program, a 10-week intensive summer training program for non-MIT science majors, continues to play a major role in developing highly talented and motivated students who go on to pursue graduate training. Moreover, MSRP-Bio has become a powerful recruiting tool for the Biology graduate program and an important means of fostering diversity at the Institute. Following their initial endowed gift a few years ago, Mike Gould and Sara Moss made a second endowed gift to the department in the form of a graduate fellowship to support MSRP-Bio alumni looking to pursue their graduate studies here in Biology.

Members of the MIT Biology community came together in November 2018 for the inaugural Friends of Biology reception. This event featured alumni, parents, supporters,

and industry representatives who mingled with faculty and graduate students to discuss the importance of basic science and research. We were also fortunate to receive a \$1 million gift in response to the event from a member of the Biology Visiting Committee. This event will become a signature annual gathering for the department.

Raising funds for discretionary purposes is vital to the department's ability to carry out its mission, remain nimble, and adapt to change. Critical to its continued success is the ability to offer competitive faculty start-up packages, offer bridge support when faculty members experience temporary gaps in research funding, and support new and emerging areas of research. This message continues to resonate with donors and helped the department to set new records in participation and funds for discretionary purposes. The Biology Department remains focused on increasing the number of donors and overall base of support for the department while continuing to seek larger gifts to support Biology's targeted and long-term needs.

Named Lectures

The department sponsored the following endowed lectures during AY2019:

- Randy Chipperfield Lecture: Eva Nogales, University of California, Berkeley
- Alexander Rich Lecture: Mario Capecchi, University of Utah
- Charles "Ned" E. Holt Memorial Lecture: Michael Rosbash, Brandeis University
- Paul F. Glenn Lecture Distinguished Lecture: Judith Campisi, The Buck Institute
- Francis O. Schmitt Memorial Lecture: Beth Stevens, Harvard University
- Malvin and Eleanor Mayer Lecture: Christine Mayr, Memorial Sloan Kettering Cancer Center

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