Report to the President for year ended June 30, 2025, Dean, School of Science

2024-2025 Highlights

Four MIT faculty members are among 23 world-class researchers who have been awarded the nation's highest honors for scientists and innovators. Professors Angela Belcher and **Emery Brown** were each presented with the National Medal of Science, and Professors Paula Hammond '84, PhD '93, and **Feng Zhang** were awarded the National Medal of Technology and Innovation.

Brown, the Edward Hood Taplin Professor of Medical Engineering and Computational Neuroscience, was recognized for work that has revealed how anesthesia affects the brain. Brown is also a member of MIT's Picower Institute for Learning and Memory and Institute for Medical Engineering and Science (IMES).

Zhang, the James and Patricia Poitras Professor of Neuroscience at MIT and a professor of brain and cognitive sciences and biological engineering, was recognized for his work developing molecular tools, including the CRISPR genome-editing system, that have the potential to diagnose and treat disease. Zhang is also an investigator at the McGovern Institute for Brain Research and a core member of the Broad Institute of MIT and Harvard.

In early August, the MIT School of Science launched a center to advance knowledge and computational capabilities in the field of sustainability science, and support decision-makers in government, industry, and civil society to achieve sustainable goals. Aligned with the Climate Project at MIT, researchers at the MIT Center for Sustainability Science and Strategy (CS3) develop and apply expertise from across the Institute to improve understanding of sustainability challenges, and thereby provide actionable knowledge and insight to inform strategies for improving human well-being for current and future generations. **Noelle Selin**, professor at MIT's Institute for Data, Systems and Society and the Department of Earth, Atmospheric and Planetary Sciences, serves as the center's inaugural faculty director. **C. Adam Schlosser** and **Sergey Paltsev**, senior research scientists at MIT, serve as deputy directors, with **Anne Slinn** as executive director.

In September 2024, MIT's Climate Project launched its six "missions," broad areas where researchers will seek to identify gaps in the global climate response that MIT can help fill, and then launch and execute research and innovation projects aimed at those areas. The mission "Restoring the atmosphere, protecting the land and oceans" is co-led by **Andrew Babbin**, a Cecil and Ida Green Career Development Professor in the Department of Earth, Atmospheric and Planetary Sciences (EAPS) and Jesse Kroll of the Department of Civil and Environmental Engineering. MIT has pledged an initial $75 million to the Climate Project, including $25 million from the MIT Sloan School of Management for a complementary effort, the MIT Climate Policy Center.

In October 2024, the Royal Swedish Academy of Sciences announced that MIT alumnus **Victor Ambros** ’75, PhD ’79 and **Gary Ruvkun**, who did his postdoctoral training at MIT, received the 2024 Nobel Prize in Physiology or Medicine. During the late 1980s, Ambros and Ruvkun both worked as postdocs in the laboratory of H. Robert Horvitz, a David H. Koch Professor at MIT, who was awarded the Nobel Prize in 2002.

Ambros, a professor at the University of Massachusetts Chan Medical School, and Ruvkun, a professor at Harvard Medical School and Massachusetts General Hospital, were honored for their discovery of microRNA, a class of tiny RNA molecules that play a critical role in gene control. “Their groundbreaking discovery revealed a completely new principle of gene regulation that turned out to be essential for multicellular organisms, including humans. It is now known that the human genome codes for over one thousand microRNAs. Their surprising discovery revealed an entirely new dimension to gene regulation. MicroRNAs are proving to be fundamentally important for how organisms develop and function,” the Nobel committee said

In December, the MIT community gathered to launch the Health and Life Sciences (HEALS) Collaborative to drive high-impact solutions through interdisciplinary projects spanning engineering, science, AI, economics, business, policy, design, and the humanities. The MIT HEALS collaborative strengthens partnerships among MIT, hospitals, and industry to fund research, share data, connect investors, and advance commercialization. At the launch event, faculty members from departments across MIT shared their work during panels that focused on the biosphere, brains, health care, immunology, entrepreneurship, artificial intelligence, translation, and collaboration. The day’s program was developed by **Amy Keating**, head of the Department of Biology, and **Katharina Ribbeck**, the Andrew and Erna Viterbi Professor of Biological Engineering. Ribbeck will serve as one of two associate directors–the other being **Iain Cheeseman**, member of the Whitehead Institute and the Herman and Margaret Sokol Professor of Biology–to the inaugural MIT HEALS director, **Angela Koehler**, a professor of biological engineering, an associate director at the Koch Institute for Integrative Cancer Research, and an Institute Member at the Broad Institute of MIT and Harvard.

In June, MIT was named the world’s top university by the QS World University Rankings. This is the 14th year in a row MIT has received this distinction. MIT was also ranked the world’s top university in 11 of the subject areas ranked by QS, as announced in March of this year. The Institute received a No. 1 ranking in the following QS subject areas: Chemical Engineering; Civil and Structural Engineering; Computer Science and Information Systems; Data Science and Artificial Intelligence; Electrical and Electronic Engineering; Linguistics; Materials Science; Mechanical, Aeronautical, and Manufacturing Engineering; Mathematics; Physics and Astronomy; and Statistics and Operational Research. MIT also placed second in seven subject areas: Accounting and Finance; Architecture/Built Environment; Biological Sciences; Business and Management Studies; Chemistry; Earth and Marine Sciences; and Economics and Econometrics.

Initiatives and Programs

Inclusion Programs

The MIT School of Science is committed to fostering a vibrant and inclusive network. We are fortunate and proud to be able to draw on the best talent in the world. We strive to ensure that each member of our community thrives, which is key to ensuring the educational excellence and scientific advancement that is central to our mission as an institution of higher learning. Our premise is simple: talented people come from all backgrounds, but gaps in access and opportunity for some groups cause challenges and a lack of inclusion. Being able to recruit the best talent ensures that we continue to do the best science. The recent decision by the MIT leadership to make tuition free for students below a certain income threshold reflects this spirit.

Events

Bridging Talents and Opportunities (BTO) held its second annual forum at the Stratton Student Center at MIT Oct. 11-12. The two-day event gathered over 500 participants, including high school students and their families, undergraduate students, professors, and leaders across STEAM (science, technology, engineering, arts, and mathematics) fields.

The forum sought to empower talented students from across the United States and Latin America to dream big and pursue higher education, demonstrating that access to prestigious institutions like MIT is possible regardless of socioeconomic barriers. The event featured inspirational talks from world-renowned scientists, innovators, entrepreneurs, social leaders, and major figures in entertainment — from Nobel laureate Rigoberta Menchú Tum to musician and producer Emilio Estefan, and more.

“Our initiative is committed to building meaningful connections among talented young individuals, their families, foundations, and leaders in science, art, mathematics, and technology,” says **Ronald Garcia Ruiz**, the Thomas A. Frank Career Development Assistant Professor of Physics at MIT and an organizer of the forum.

Education

School of Science Postdoctoral Fellowship Program

This new initiative launched by the School of Science Dean’s Office creates a cohort-based postdoctoral fellowship program with a focus on cross-disciplinary science and innovation. This fellowship is intended to recruit outstanding talent to the MIT School of Science and offers a competitive postdoctoral compensation package. This fellowship also includes an academic leadership module that fellows will attend as part of the program. Additionally, the Dean’s Office

will host community events, including a symposium where fellows will present their work to the larger School of Science community. This cohort-based fellowship program is expected to start in the Fall of 2025.

Open Learning

The third annual MIT Prize for Open Data was awarded to 10 individual and group research projects. Spearheaded by Chris Bourg, director of MIT Libraries, and **Rebecca Saxe**, associate dean of the School of Science and John W. Jarve (1978) Professor of Brain and Cognitive Sciences, the MIT Prize for Open Data highlights the value of open data at MIT and encourages the next generation of researchers. Nominations were solicited from across the Institute, with a focus on trainees: research technicians, undergraduate or graduate students, or postdocs. The research presentation event was hosted jointly by the School of Science and the MIT Libraries, honoring the prize winners and eight honorable mention recipients.

In 2024-2025, Open Learning offered new courses and resources featuring School of Science content and faculty. Two new MITx and three new MITxPro courses were offered this year: Science of Learning and Memory with Professor **John Gabrieli**, and Senior Lecturer Laura Frawley; Machine Learning, Modeling, and Simulation: Engineering Problem-Solving in the Age of AI with Professor **Laurent Demanet**; and Quantum Computing Realities with Professors **Isaac Chung**, **Will Oliver**, **Peter Shor**, and **Aram Harrow**.

Many new Open Courseware courses and supplemental open courseware resources were developed: 7.003 Applied Molecular Biology; 8.033 Introduction to Relativity and Spacetime Physics; 8.902 Astrophysics II; RES.18-016 Multivariable Calculus Recitation Notes; RES.18-010 A Vision of Linear Algebra; 18.745 Lie Groups and Lie Algebras I; 18.755 Lie Groups and Lie Algebras II; 18.757 Representations of Lie Groups; RES.18-015 Topics in Fourier Analysis; 18.238 Geometry and Quantum Field Theory; 18.226 Probabilistic Methods in Combinatorics ; RES.12-001 Topics in Fluid Dynamics; RES.1803 Differential Equations.

Education Awards

The Committed to Caring (C2C) program at MIT is a student-driven initiative that celebrates faculty members who have served as exceptional mentors to graduate students. In the 2023-2025 academic years, the following faculty members were identified by the program: **Nuh Gedik** (Physics); **Myriam Heiman** (BCS); **Michael McDonald** (Physics); **Tracy Slatyer** (Physics); **Iain Stewart** (Physics); **Andrew Vanderburg** (Physics); and **Xiao Wang** (Chemistry).

MIT School of Science teaching prize was awarded to three recipients for 2024. The prizes are awarded to School of Science faculty members who demonstrate exceptional instruction. Winners are chosen from nominations by their students or colleagues. **Henry Cohn**, adjunct professor in the Department of Mathematics, was awarded a prize for his dedication to teaching several classes, specifically 18.510 (Introduction to Mathematics Logic and Set Theory) and

18.701 (Algebra). Nominators highlighted Cohn's engaging instruction and his ability to make a difficult class rewarding and fun. **Barbara Imperiali**, Class of 1922 Professor of Biology and Chemistry, and **Ronald Raines**, Roger and Georges Firmenich Professor of Natural Products Chemistry, were each awarded a prize for co-teaching 5.08/7.08 (Fundamentals of Chemical Biology). Nominators noted their infectious enthusiasm for the material, success in preparing students for further study, and synergy in the classroom.

Scott Sheffield, the Leighton Family Professor of Mathematics, was honored with a 2025 "teaching with technology" award. Co-sponsored by MIT Open Learning and the Office of the Vice Chancellor, the awards recognize MIT educators for their innovations and give the Institute's community the opportunity to learn from their practices.

Research

School of Science researchers seek to answer fundamental questions about nature ranging from the microscopic — where a neuroscientist might isolate the electrical activity of a single neuron — to the telescopic — where an astrophysicist might scan hundreds of thousands of stars to find Earth-like planets in their orbits. The following is only a subset of the school's many research programs and publications and focuses on the school's research strengths in climate sciences, life sciences, and quantum science and information. For more information on specific research discoveries, please consult the School of Science departments' MIT Reports to the President.

Climate Science and Sustainability

A 2025 report by the American Physical Society and led by MIT professor of physics **Washington Taylor** provided an overview of the major experimental carbon dioxide removal (CDR) approaches. The report focuses on methods that have the biggest potential for removing carbon dioxide, at the scale of gigatons per year, which is the magnitude that would be required to have a climate-stabilizing impact.

To provide a more comprehensive and actionable analysis of carbon dioxide removal (CDR), a new study by researchers at the MIT Center for Sustainability Science and Strategy (CS3) expands the option set to include biochar (charcoal produced from plant matter and stored in soil) and enhanced weathering (spreading finely ground rock particles on land to accelerate storage of CO2 in soil and water). The study then evaluates portfolios of all five current CDR options — in isolation and in combination — to assess their capability to meet the 1.5 C goal, and their potential impacts on land, energy, and policy costs. The study appears in the journal Environmental Research Letters. **Sergey Paltsev**, CS3 deputy director, MIT Energy Initiative senior research scientist, and supervising co-author of the study, says the study highlights the need for enhancing knowledge about local conditions that favor some CDR options over others.

A study in the journal *Frontiers in Environmental Science* provides the most comprehensive analysis to date of competing land-use and technology options to limit global warming to 1.5 C. Led by researchers at the CS3, the study applies the MIT Integrated Global System Modeling (IGSM) framework to evaluate costs and benefits of different land-based climate mitigation options. The MIT scenario shows that there is enough land to support a 1.5 degree C future as long as effective policies at national and global levels are in place, according to CS3 Principal Research Scientist **Angelo Gurgel,** the study's lead author.

In late July 2024, the Climate Project at MIT appointed leaders for each of its six focal areas, or Climate Missions. The mission titled "Restoring the atmosphere, protecting the land and oceans" is centered on removing or storing greenhouse gases that have already been emitted into the atmosphere, such as carbon dioxide and methane, and on protecting ocean and land ecosystems, including food and water systems. MIT chose two mission directors: **Andrew Babbin** and Jesse Kroll. The two bring together research expertise from two critical domains of the Earth system, oceans and the atmosphere, as well as backgrounds in both the science and engineering underlying our understanding of Earth's climate. As co-directors, they jointly link MIT's School of Science and School of Engineering in this domain. Babbin is a Cecil and Ida Green Career Development Professor in MIT's Program in Atmospheres, Oceans, and Climate. He is a marine biogeochemist whose specialty is studying the carbon and nitrogen cycle of the oceans, work that is related to evaluating the ocean's capacity for carbon storage, an essential element of this mission's work.

An MIT-led study confirms that the Antarctic ozone layer is healing, as a direct result of global efforts to reduce ozone-depleting substances. Scientists including the MIT team led by study author **Susan Solomon**, the Lee and Geraldine Martin Professor of Environmental Studies and Chemistry, have observed signs of ozone recovery in the past. But the new study is the first to show, with high statistical confidence, that this recovery is due primarily to the reduction of ozone-depleting substances, versus other influences such as natural weather variability or increased greenhouse gas emissions to the stratosphere. Graduate student Peidong Wang from the Solomon group in the Department of Earth, Atmospheric and Planetary Sciences (EAPS) is the lead author. His co-authors include Solomon and EAPS Research Scientist Kane Stone, along with collaborators from multiple other institutions.

In a study appearing in *One Earth*, the scientists, including **Sai Ravela**, principal research scientist in MIT's Department of Earth, Atmospheric and Planetary Sciences (EAPS) and member of the CS3, report that, for the highly populated coastal country of Bangladesh, what was once a 100-year event could now strike every 10 years — or more often — by the end of the century. In a future where fossil fuels continue to burn as they do today, what was once considered a catastrophic, once-in-a-century storm tide will hit Bangladesh, on average, once per decade. And the kind of storm tides that have occurred every decade or so will likely batter the country's coast more frequently, every few years.

Life Sciences

MIT chemists have now come up with a new way to determine 3D genome structures, using generative artificial intelligence. Their technique can predict thousands of structures in just minutes, making it much speedier than existing experimental methods for analyzing the structures. Using this technique, researchers could more easily study how the 3D organization of the genome affects individual cells' gene expression patterns and functions. **Bin Zhang**, an associate professor of chemistry and the senior author of the study, and MIT graduate students Greg Schuette and Zhuohan Lao are the lead authors of the *Science Advances* paper. ChromoGen, the model that the researchers created, has two components. The first component, a deep learning model taught to "read" the genome, analyzes the information encoded in the underlying DNA sequence and chromatin accessibility data, the latter of which is widely available and cell type-specific. The second component is a generative AI model that predicts physically accurate chromatin conformations, having been trained on more than 11 million chromatin conformations.

When a new species is introduced into an ecosystem, it may succeed in establishing itself, or it may fail to gain a foothold and die out. MIT professor of physics **Jeff Gore** is the senior author of the *Nature Ecology and Evolution* paper and is part of a team that has now devised a formula that can predict which of those outcomes is most likely. The researchers created their formula based on analysis of hundreds of different scenarios that they modeled using populations of soil bacteria grown in their laboratory. They now plan to test their formula in larger-scale ecosystems, including forests. This approach could also be helpful in predicting whether probiotics or fecal microbiota treatments (FMT) would successfully combat infections of the human GI tract.

FragFold, developed by MIT Biology researchers, is a computational method with potential for impact on biological research and therapeutic applications.Recently published in Proceedings of the National Academy of Sciences, the new method builds on existing artificial intelligence models to computationally predict protein fragments that can bind to and inhibit full-length proteins in E. coli. Theoretically, this tool could lead to genetically encodable inhibitors against any protein. The work was done in the lab of associate professor of biology and Howard Hughes Medical Institute investigator **Gene-Wei L**i in collaboration with the lab of Jay A. Stein (1968) Professor of Biology, professor of biological engineering, and department head Amy Keating.

MIT biologists identified proteins that influence splicing of about half of all human introns, allowing for more complex types of gene regulation. RNA splicing, a process critical for gene expression, is controlled by a large protein-RNA complex called the spliceosome. The researchers have now discovered a new layer of regulation that helps to determine which sites on the messenger RNA molecule the spliceosome will target. The findings suggest that the control of RNA splicing, a process that is fundamental to gene expression, is more complex than previously known. **Christopher Burge**, the Uncas and Helen Whitaker Professor of Biology at MIT, is the senior author of the study, which appeared in Nature Communications.

Cancer Biology

By studying the microscopic roundworm *Caenorhabditis elegans,* scientists at MIT's McGovern Institute for Brain Research have begun to unravel a longstanding mystery about the factors that control apoptosis: how a protein capable of preventing programmed cell death can also promote it. Their study, led by **Robert Horvitz**, the David H. Koch Professor of Biology at MIT, and reported in the journal *Science Advances*, sheds light on the process of cell death in both health and disease. These findings, by graduate student Nolan Tucker and former graduate student, now MIT faculty colleague, **Peter Reddien**, have revealed that a protein interaction long thought to block apoptosis in *C. elegans* likely instead has the opposite effect, says Horvitz, who is also an investigator at the Howard Hughes Medical Institute and the McGovern Institute. Horvitz shared the 2002 Nobel Prize in Physiology or Medicine for discovering and characterizing the genes controlling cell death in *C. elegans*.

Molecular and Cellular Biology

McGovern researchers, including **Feng Zhang**, the James and Patricia Poitras Professor of Neuroscience at MIT, who led the research, have discovered molecular systems, which they call TIGR (Tandem Interspaced Guide RNA) systems, that use RNA to guide them to specific sites on DNA. TIGR systems can be reprogrammed to target any DNA sequence of interest, and they have distinct functional modules that can act on the targeted DNA. In addition to its modularity, TIGR is very compact compared to other RNA-guided systems, like CRISPR, which is a major advantage for delivering it in a therapeutic context. These findings are reported in the journal *Science*.

Bonnie Berger, the Simons Professor of Mathematics and the head of the Computation and Biology group in MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL), has a paper near acceptance to *PNAS* on a new AI-based model that identifies antibody drug targets faster and with a higher hit rate than existing AI methods. The model specifically targets the tips of antibodies, which are hypervariable regions that are the hardest part of an antibody for models to predict, as these regions are not governed by evolutionary patterns that other models depend on. These regions are also the part of antibodies that specifically latch onto antigens, and their structure determines an antibody's effectiveness against viruses and pathogens. Berger's method accurately predicts how an antibody's tips will turn out, based on their amino-acid sequence alone. The method could be paired with other protein language models to find effective drug candidates, faster, before going into the lab.

New research from MIT professor of biology and Whitehead Institute for Biomedical Research member **Richard Young** and colleagues, published in the journal *Cell*, reveals that many chronic diseases have a common denominator that could be driving their dysfunction: reduced protein mobility. What this means is that around half of all proteins active in cells slow their movement when cells are in a chronic disease state, reducing the proteins' functions. The researchers' findings suggest that protein mobility may be a linchpin for decreased cellular function in chronic disease, making it a promising therapeutic target. Discovering that decreased

protein mobility in the presence of oxidative stress could be driving many of the symptoms of chronic disease provides opportunities to develop therapies to rescue protein mobility.

Immune molecules called cytokines play important roles in the body's defense against infection, helping to control inflammation and coordinating the responses of other immune cells. A growing body of evidence suggests that some of these molecules also influence the brain, leading to behavioral changes during illness. Two new studies from scientists at MIT, including **Gloria Choi**, an associate professor of brain and cognitive sciences and a member of MIT's Picower Institute for Learning and Memory, and Harvard Medical School, focused on a cytokine called IL-17, now add to that evidence. The researchers found that IL-17 acts on two distinct brain regions — the amygdala and the somatosensory cortex — to exert two divergent effects. In the amygdala, IL-17 can elicit feelings of anxiety, while in the cortex it promotes sociable behavior.

MIT scientists, including senior author **Nikta Fakhri**, associate professor of physics, have used light to control how a single cell jiggles and moves during its earliest stage of development. Their results, which appeared in the journal Nature Physics, provide scientists with a new optical tool for controlling cell shape in its earliest developmental stages. Such a tool, they envision, could guide the design of synthetic cells, such as therapeutic "patch" cells that contract in response to light signals to help close wounds, or drug-delivering "carrier" cells that release their contents only when illuminated at specific locations in the body. Overall, the researchers see their findings as a new way to probe how life takes shape from a single cell.

Building on more than two decades of research, a study by MIT neuroscientists at The Picower Institute for Learning and Memory, including senior author **Mark Bear**, reported a new way to treat pathology and symptoms of fragile X syndrome, the most common genetically-caused autism spectrum disorder. The team showed that augmenting a novel type of neurotransmitter signaling reduced hallmarks of fragile X in mouse models of the disorder.

In findings published in *Nature*, **Ila Fiete**, an associate investigator in the McGovern Institute for Brain Research and director of the K. Lisa Yang Integrative Computational Neuroscience (ICoN) Center at MIT, reports that a mathematical model called peak selection can explain how modules emerge without strict genetic instructions. Her team's findings, which apply to brain systems and ecosystems, help explain how modularity occurs across nature, no matter the scale.

Brain and Cognitive Sciences

A decade after scientists in The Picower Institute for Learning and Memory at MIT first began testing whether sensory stimulation of the brain's 40Hz "gamma" frequency rhythms could treat Alzheimer's disease in mice, a growing evidence base supporting the idea that it can improve brain health — in humans as well as animals — has emerged from the work of labs all over the world. A new open-access review article in PLOS Biology describes the state of research so far and presents some of the fundamental and clinical questions at the forefront of the noninvasive

gamma stimulation now. **Li-Huei Tsai**, Picower Professor of Neuroscience and director of The Picower Institute and the Aging Brain Initiative at MIT, is senior author of the review with postdoc Jung Park. “People have used many different ways to induce gamma including sensory stimulation, transcranial alternating current stimulation, or transcranial magnetic stimulation, but the key is delivering stimulation at 40 hertz. They all see beneficial effects,” said Tsai.

Using the EEG during surgery for children, researchers were able to study the brain’s response and reduce the amount of anesthesia given to maintain the same level of unconsciousness, according to study co-author **Emery N. Brown**, the Edward Hood Taplin Professor of Medical Engineering and Computational Neuroscience at MIT, an anesthesiologist at Massachusetts General Hospital, and a professor at Harvard Medical School. The study appeared in *JAMA Pediatrics*.

Conscious thought requires synchronized communication — mediated by brain rhythms in specific frequency bands — between basic sensory and higher-order cognitive regions of the brain. The new results carried out by senior author **Earl K. Miller**, Picower Professor in The Picower Institute for Learning and Memory and MIT’s Department of Brain and Cognitive Science, published in the *Proceedings of the National Academy of Sciences,* show that when animals were under propofol-induced general anesthesia, a sensory region retained the capacity to detect simple surprises but communication with a higher cognitive region toward the front of the brain was lost, making that region unable to engage in its “top-down” regulation of the activity of the sensory region and keeping it oblivious to simple and more complex surprises alike.

Quantum Science, Mechanics, Information, Computing, and AI

Physicists at MIT, including co-lead author **Joel Wang**, a research scientist in MIT’s Research Laboratory of Electronics (RLE), and Harvard University have directly measured superfluid stiffness for the first time in “magic-angle” graphene — materials that are made from two or more atomically thin sheets of graphene twisted with respect to each other at just the right angle to enable a host of exceptional properties, including unconventional superconductivity. This superconductivity makes magic-angle graphene a promising building block for future quantum-computing devices, but exactly how the material superconducts is not well understood. The results, which are reported in the journal *Nature*, represent the first time scientists have directly measured superfluid stiffness in a two-dimensional material. To do so, the team developed a new experimental method which can now be used to make similar measurements of other two-dimensional superconducting materials.

MIT physicists, including senior author **Nuh Gedik**, the Donner Professor of Physics at MIT, have created a new and long-lasting magnetic state in a material, using only light. In a study appearing in *Nature*, the researchers report using a terahertz laser — a light source that oscillates more than a trillion times per second — to directly stimulate atoms in an antiferromagnetic material. The laser’s oscillations are tuned to the natural vibrations among the

material's atoms, in a way that shifts the balance of atomic spins toward a new magnetic state. The results provide a new way to control and switch antiferromagnetic materials, which are of interest for their potential to advance information processing and memory chip technology.

Fundraising and Philanthropy

In November 2024, **Jennifer Rosales** joined the Dean's Office as the new assistant dean for development in the School of Science. Rosales joined the school from Boston Children's Hospital Trust, which she served for the past seven years, first as Senior Director and then as Assistant Vice President of Foundation and Research Relations. Previously, she served for 12 years in roles of increasing responsibility including, ultimately, Senior Executive Director of Corporate and Foundation Relations at the UCLA College of Letters and Sciences. She also held leadership roles in the Corporation and Foundation Relations program at the University of Hawaii's statewide system.

Rosales brings to the role a successful fundraising track record—in higher education, health care, and the physical and life sciences—as well as experience leading teams in fast-paced environments, developing fundraising strategies for key donors, and providing support for strategy and implementation of key campaign and leadership initiatives. Highlights from across her career include securing principal and major gifts as well as grants for higher education, science, and medical programs, including interdisciplinary and multi-institution initiatives.

This May, the school and the Department of Physics announced a $20 million gift from the Leinweber Foundation, in addition to a $5 million commitment from the MIT School of Science, to support theoretical physics research and education at MIT. Leinweber Foundation gifts to five institutions, totaling $90 million, will establish the newly renamed MIT Center for Theoretical Physics – A Leinweber Institute within the Department of Physics, affiliated with the Laboratory for Nuclear Science at the School of Science, along with Leinweber Institutes for Theoretical Physics at three other top research universities: the University of Michigan, the University of California at Berkeley, and the University of Chicago, as well as a Leinweber Forum for Theoretical and Quantum Physics at the Institute for Advanced Study.

Awards and Honors

Faculty Awards and Honors

Every year, academic and professional organizations honor numerous School of Science faculty members for their innovative research, as well as their service to the community. Individual

reports from the school's departments, labs, and centers will document these awards more completely, but certain honors deserve additional mention.

In addition to Professors **Emery Brown** and **Feng Zhang** receiving the National Medal of Science and the National Medal of Technology, respectively, out of the four faculty recipients of those awards, two additional MIT alumni also accepted awards: **Richard Lawrence Edwards '76**, a graduate of the Department of Earth, Atmospheric and Planetary Sciences and of the Department of Architecture, who is now a professor at the University of Minnesota, received a National Medal of Science for his work in geochemistry. And **Noubar Afeyan PhD '87**, a graduate of the Department of Chemical Engineering and current member of the MIT Corporation, accepted one of two National Medals of Technology and Innovation awarded to an organization. These awards went to the biotechnology companies Moderna, which Afeyan co-founded along with Institute Professor **Robert Langer**, and Pfizer, for their development of vaccines for Covid-19.

John Joannopoulos, an innovator and mentor in the fields of theoretical condensed matter physics and nanophotonics, has been named the recipient of the 2024-2025 James R. Killian Jr. Faculty Achievement Award. Joannopoulos is the Francis Wright Davis Professor of Physics and director of MIT's Institute for Soldier Nanotechnologies. He has been a member of the MIT faculty for 50 years.

Seven MIT faculty, including **Sarah Millholland**, an assistant professor of physics at MIT and member of the Kavli Institute for Astrophysics and Space Research, and 21 additional MIT alumni are among 126 early-career researchers honored with 2025 Sloan Research Fellowships by the Alfred P. Sloan Foundation.

Two faculty from the School of Science, were awarded the Presidential Early Career Award for Scientists and Engineers (PECASE). **Netta Engelhardt**, the Biedenharn Career Development Associate Professor of Physics, was nominated by the Department of Energy for her research on the black hole information paradox and its implications for the fundamental quantum structure of space and time. **Robert Gilliard Jr.**, the Novartis Associate Professor of Chemistry, was selected based on the results generated from his 2020 National Science Foundation CAREER award entitled: "CAREER: Boracycles with Unusual Bonding as Creative Strategies for Main-Group Functional Materials."

Cognitive neuroscientist **Evelina Fedorenko** received the Troland Award from National Academy of Sciences for her groundbreaking discoveries about the brain's language system.

The 2025 International Congress of Basic Science awarded the Basic Science Lifetime Award to two MIT Science faculty. Mathematics Professor **George Lusztig** was honored for "his unparalleled contributions to representation theory, and the profound influence of the theory of Deligne–Lusztig varieties, and Kazhdan–Lusztig theory." Physics Professor **Sam Ting** was given the award for "his transformative discovery of the J/ψ meson, groundbreaking contributions to space-based research, and visionary leadership in global collaborations in experimental physics."

The Ho-Am Foundation selected **Gloria Choi**, Associate Professor in The Picower Institute for Learning and Memory and the Department of Brain and Cognitive Sciences at MIT, to receive the 2025 Samsung Ho-Am Prize for Medicine.

Six current MIT affiliates members and more than 25 alumni were named 2024 American Association for the Advancement of Science (AAAS): **Noubar Afeyan** PhD ’87, life member of the MIT Corporation; **Cynthia Breazeal** SM ’93, ScD ’00, professor of media arts and sciences; **Alan Edelman** PhD ’89 is an applied mathematics professor for the Department of Mathematics and leads the Applied Computing Group of the Computer Science and Artificial Intelligence Laboratory; **Robert B. Millard** '73, life member and chairman emeritus of the MIT Corporation; **Jagadeesh S. Moodera**, senior research scientist in the Department of Physics; and **Noelle Eckley Selin**, the director of the MIT Center for Sustainability Science and Strategy and a professor in the Institute for Data, Systems and Society and the Department of Earth, Atmospheric and Planetary Sciences.

In spring 2025, the National Academy of Sciences elected five MIT faculty as fellows of the academy including: **Scott Sheffield**, the Leighton Family Professor of Mathematics, Department of Mathematics; **Benjamin Weiss**, the Robert R. Schrock Professor of Earth and Planetary Sciences; **Yukiko Yamashita**, investigator of Howard Hughes Medical Institute; and professor of biology at MIT and the Whitehead Institute for Biomedical Research.

In fall 2024, two MIT faculty members and five MIT alumni were elected to the National Academy of Medicine. **Matthew Vander Heiden** is the director of the Koch Institute for Integrative Cancer Research at MIT, a Lester Wolfe Professor of Molecular Biology, and a member of the Broad Institute of MIT and Harvard. **Fan Wang** is a professor of brain and cognitive sciences, an investigator at the McGovern Institute, and director of the K. Lisa Yang and Hock E. Tan Center for Molecular Therapeutics at MIT.

The U.S. Department of Defense announced three MIT professors among the members of the 2025 class of the Vannevar Bush Faculty Fellowship (VBFF). The fellowship is the DoD's flagship single-investigator award for research, inviting the nation's most talented researchers to pursue ambitious ideas that defy conventional boundaries. **Mehrdad Jazayeri**, professor of brain and cognitive sciences and an investigator at the McGovern Institute, was one of the three recipients. Jazayeri plans to use the VBFF award to integrate ideas from cognitive science, neuroscience, and machine learning with experimental data in humans, animals, and computer models to develop a computational understanding of cognitive and emotional intelligence.

School of Science professors **Steven Flavell**, **Mary Gehring**, **Mehrad Jazayeri**, and **Gene-Wei Li** were named 2024 investigators by the Howard Hughes Medical Institute (HHMI). Flavell, associate professor of brain and cognitive sciences and investigator in the Picower Institute for Learning and Memory, seeks to uncover the neural mechanisms that generate the internal states of the brain, for example, different motivational and arousal states. Gehring, professor of biology and core member and David Baltimore Chair in Biomedical Research at the Whitehead Institute for Biomedical Research, studies how plant epigenetics modulates plant growth and development, with a long-term goal of uncovering the essential genetic and epigenetic elements

of plant seed biology. Jazayeri, a professor of brain and cognitive sciences and an investigator at the McGovern Institute for Brain Research, studies how physiological processes in the brain give rise to the abilities of the mind. Li, associate professor of biology, has been working on quantifying the amount of proteins cells produce and how protein synthesis is orchestrated within the cell.

Student awards and honors

Yiming Chen and **David Oluigbo** were two of four students selected as 2025 Rhodes Scholars and will begin fully funded postgraduate studies at Oxford University in the U.K. next fall. Chen, from Beijing, China, and the Washington area, was named one of four Rhodes China Scholars. At Oxford, she will pursue graduate studies in engineering science, working toward her ongoing goal of advancing AI safety and reliability in clinical workflows. Oluigbo, from Washington, is a senior majoring in artificial intelligence and decision making and minoring in brain and cognitive sciences. At Oxford, he will undertake an MS in applied digital health followed by an MS in modeling for global health.

Lara Ozkan, a senior majoring in computer science and molecular biology, plans to pursue through her 2025 Marshall Scholarship an MPhil in biological science at Cambridge University's Sanger Institute, followed by a master's by research degree in artificial intelligence and machine learning at Imperial College London.

In the Department of Mathematics, graduate students **Ryan Chen** and **Alex Cohen** have been awarded 2025 Clay Research Fellowships, for a term of five years.

Andrii Zahorodnii was one of three MIT students awarded a 2025 Schwarzman Scholarship and will join the program's 10th cohort to pursue a master's degree in global affairs at Tsinghua University in Beijing, China. Zahorodnii graduates with a bachelor of science and a master of engineering degree in computer science and cognitive sciences. An engineer as well as a neuroscientist, he has conducted research at MIT with former Professor Guangyu Robert Yang's MetaConscious Group and the Ila Fiete Lab.

MIT senior **Markey Freudenburg-Puricelli**, majoring in Earth, Atmospheric, and Planetary Sciences, recent alumnae **Abigail ("Abbie") Schipper** '24, who graduated from MIT with a BS in mechanical engineering and a minor in biology, and **Rachel Zhang** '21, a physics major, have been selected as Gates Cambridge Scholars. They will begin graduate studies this fall in the field of their choice at Cambridge University in the U.K.

For the fifth year in a row, MIT undergraduates from the Department of Mathematics won the top five spots in the Putnam Math Competition.The top five scorers each year are named Putnam Fellows. Senior **Brian Liu** and juniors **Papon Lapate** and **Luke Robitaille** are now three-time Putnam Fellows, sophomore **Jiangqi Dai** earned his second win, and first-year **Qiao Sun** earned his first. Each receives a $2,500 award. This is also the fifth time that any school has had all five Putnam Fellows. First-year **Jessica Wan** was the top-scoring woman, finishing in

the top 25, which earned her the $1,000 Elizabeth Lowell Putnam Prize. She is the eighth MIT student to receive this honor since the award was created in 1992. This is the sixth year in a row that an MIT woman has won the prize.

School of Science alumni **Jupneet Singh** ’23 and **Rupert Li** ’24 are two of four MIT affiliates among the 30 recipients of this year’s Paul and Daisy Soros Fellowships for New Americans.

Four rising seniors were selected to receive a 2025 Barry Goldwater Scholarship, including Avani Ahuja and Jacqueline Prawira in the School of Engineering and **Julianna Lian** and **Alex Tang** from the School of Science. An estimated 5,000 college sophomores and juniors from across the United States were nominated for the scholarships, from which only 441 were selected.

Eight with MIT connections won 2025 Hertz Foundation Fellowships, which provide five years of doctoral-level research funding to honorees. The Hertz Fellows include science majors: **Matthew Caren ’25** (EECS/Math/Music)**; April Qiu Cheng ’24** (Physics)**; Arav Karighattam**, who begins his PhD at the Institute this fall in mathematics**; Benjamin Lou ’25** (Physics)**; Albert Qin ’24** (Physics/Math)**;** and **Ananthan Sadagopan ’24** (Chemistry/Biology)**.**

Staff rewards and recognition

At the 2025 MIT Excellence Awards, nine members of the Building 68 staff were honored with the “Serving Our Community” award. This team is a terrific example of one of the under-the-radar support systems that our scientific researchers rely on to produce world-changing advances. The Building 68 “Kitchen Staff” are not under-the-radar to the 200 people in the 23 research labs who depend on them. This team runs a very specific kind of ‘kitchen’ that is quite simply, indispensable to research. They supply sterile solutions and glassware, distribute dozens of lab coats, pour hundreds of media plates, and go out of their way to accommodate each lab’s specific and complex research needs.The team includes: **Brikti Abera**; **Ann Marie Budhai**; **Nicholas Budhai**; **Daniel Honiker**; **Janet Katin**; **Umme Khan**; **Shuming Lin**; **Kelly McKinnon**; and **Karen O'Leary**.

The School of Science Staff Excellence Awards programs acknowledge the dedication and hard work of our staff. In addition to the Infinite Mile and Infinite Expansion Awards, the school continues its Spot Awards, which rewards employees for going beyond the requirements of their assigned duties.

This year, the 2025 Infinite Mile Award winners included: **Tim Brothers**, the Wallace Astrophysical Observatory site manager and a technical instructor in EAPS; **Brenda Carbone**, administrative assistant in EAPS; **Peter Dourmashkin**, senior lecturer in the Department of Physics; **Samantha Edelen**, special projects/events coordinator in the Department of Biology; **Leah Kahn**, course manager in the academic programs area of the Department of Physics; **Martha Pham**, administrative assistant in the Department of Biology; **Mandana Sassanfar**, senior lecturer in biology and Director of Diversity and Science Outreach in the departments of

biology, brain and cognitive sciences, the Center for Brains, Minds and Machines, and The Picower Institute for Learning and Memory; and **Cindy Woolley**, administrative assistant in the Department of Biology.

The Infinite Expansion Awards highlight the contributions of postdoctoral scholars and research scientists or equivalents. The 2025 winners were: **Lior Alon**, instructor and former postdoc in the Department of Mathematics; **Saverio Cambioni**, a postdoc in EAPS; **Cameron Dean**, senior postdoc in the MIT Heavy Ion Group; **David Grimes**, Digital Learning Lab Scientist and Instructor in the Department of Chemistry; **Benjamin Lehmann**, Pappalardo Fellow in the Department of Physics; **Mariel Price**, a postdoc in the Department of Chemistry; **Jeffery Scott**, a research scientist in EAPS and the Center for Sustainability Science and Strategy; **Sarah Sterling**, the cryo-EM Facility Director in MIT.nano; **Hiroki Sugihara**, a research scientist in The Picower Institute for Learning and Memory.

Personnel

Appointments and Promotions

The following faculty members were promoted to full professor: **Myriam Heiman** (BCS); **Robert Gilliard** (Chemistry); and **Joe Checkelsky** (Physics).

The following faculty members were promoted to associate professor with tenure: **Eliezer Calo** (Biology); **Joseph (Joey) Davis** (Biology); **Jeremy Hahn** (Mathematics, double jump to tenure); **Dor Minzer** (Mathematics, double jump to tenure); **Phil Harris** (Physics); **Max Metlitski** (Physics); and **Erin Kara** (Physics, early tenure).

The following faculty members were promoted to associate professor without tenure: **Ankur Jain** (Biology); **Seychelle Vos** (Biology); **Brett McGuire** (Chemistry); **Kristin Bergmann** (EAPS); **William Frank** (EAPS); **Long Ju** (Physics); **Ron Garcia Ruiz** (Physics).

The following faculty members joined the School faculty as assistant professors:

In fall 2024, the following faculty joined the School of Science: **Shaoyun Bai** (Mathematics); **Jacopo Borga** (Mathematics); **Whitney Henry** (Biology, Whitehead); **Christoph Kehle** (Mathematics); **Lyle Nelson** (EAPS); and **Shu-Heng Shao** (Physics).

In fall 2025, the following faculty will join the School: **Ronald Vale** (Biology, full professor); **Adityanarayan Radhakrishnan** (Mathematics); **Kevin Burdge** (Physics); **Brooke Russell** (Physics); **Henry Cohn** (Mathematics, full professor); **Shafi Goldwasser** (Mathematics, full professor); and **Yunha Hwang** (Biology/SCC).

The following faculty members retired, effective 6/30/2025 unless otherwise noted: **Robert Sauer** (Biology, effective 1/15/2025); **Edward Boyle** (EAPS); **Bradley Hager** (EAPS, effective 1/15/2025); **George Lusztig** (Mathematics, effective 1/15/2025); and **Jackie Hewitt** (Physics).

The following faculty members departed (non-retirement), effective 6/30/2025 unless otherwise noted: **Mircea Dinca** (Chemistry, effective 1/15/2025); **Andrew Lawrie** (Mathematics); **Mark Vogelsberger** (Physics, effective 3/31/25); and **Brent Minchew** (EAPS).

The following changes in role occurred:

Professor **David McGee** assumed the department head of EAPS, effective January 15, 2025 and will succeed Professor **Robert van der Hilst**. McGee studies the atmosphere's response to paleoclimate changes, yielding important insights into the climate change the planet is currently undergoing. He was also instrumental in the department's success, serving since September 2020 as associate department head for diversity, equity, and inclusion within EAPS. He joined the MIT faculty in 2012 and in 2018 received the Excellence in Mentoring Award from MIT's Undergraduate Advising and Academic Programming office. In 2016, he became the director of MIT's Terrascope first-year learning community; and in 2023, for his work with Terrascope, McGee received the school's highest award, the School of Science Teaching Prize.

Noelle Selin, professor at MIT's Institute for Data, Systems and Society and the Department of Earth, Atmospheric and Planetary Sciences, was appointed the center's inaugural faculty director at the MIT Center for Sustainability Science and Strategy (CS3).

Troy Van Voorhis, the Robert T. Haslam and Bradley Dewey Professor of Chemistry, is stepping down as department head of the Department of Chemistry effective August 31, 2025. Van Voorhis has served as department head since 2019, previously serving the department as associate department head since 2015.

Alex K. Shalek, the J. W. Kieckhefer Professor in the MIT Institute for Medical Engineering and Sciences (IMES) and Department of Chemistry, has been named the new director of IMES, effective Aug. 1. Shalek is a core member of IMES, a professor of chemistry, and holds several leadership positions, including director of the Health Innovation Hub. He is also an extramural member of MIT's Koch Institute for Integrative Cancer Research; a member of the Ragon Institute of Mass General, MIT, and Harvard; an institute member of the Broad Institute of MIT and Harvard; an assistant in immunology at Mass General Brigham; and an instructor in health sciences and technology at Harvard Medical School.

In Memoriam

Gerald E. Schneider, a professor emeritus of psychology and member of the MIT community for over 60 years, passed away on Dec. 11, 2024. He was 84. Schneider was an authority on the relationships between brain structure and behavior, concentrating on neuronal development, regeneration or altered growth after brain injury, and the behavioral consequences of altered connections in the brain.

Longtime MIT Professor **Anthony "Tony" Sinskey** ScD '67, who was also the co-founder and faculty director of the Center for Biomedical Innovation (CBI), passed away on February 12. Sinskey's lab at MIT explored methods for metabolic engineering and the production of biomolecules. Over the course of his research career, he published more than 350 papers in leading peer-reviewed journals for biology, metabolic engineering, and biopolymer engineering, and filed more than 50 patents. Well-known in the biopharmaceutical industry, Sinskey contributed to the founding of multiple companies, including Metabolix, Tepha, Merrimack Pharmaceuticals, and Genzyme Corporation. Sinskey's work with CBI also led to impactful research papers, manufacturing initiatives, and educational content since its founding in 2005.

Nuclear physicist and MIT Professor Emeritus **Lee Grodzins** died on March 6. Grodzins was a pioneer in nuclear physics research. He was perhaps best known for the highly influential experiment determining the helicity of the neutrino, which led to a key understanding of what's known as the weak interaction. He was also the founder of Niton Corp. and the nonprofit Cornerstones of Science, and was a co-founder of the Union of Concerned Scientists. He retired in 1999 after serving as an MIT physics faculty member for 40 years. As a member of the Laboratory for Nuclear Science (LNS), he initiated the relativistic heavy-ion physics program. He published over 170 scientific papers and held 64 U.S. patents.

Earle Leonard Lomon PhD '54, MIT professor emeritus of physics, died on March 7 at the age of 94. A longtime member of the Center for Theoretical Physics, Lomon was interested primarily in the forces between protons and neutrons at low energies, where the effects of quarks and gluons are hidden by their confinement. His research focused on the interactions of hadrons — protons, neutrons, mesons, and nuclei — before it was understood that they were composed of quarks and gluons.

Frederick "Fred" Davis Greene II, professor emeritus in the MIT Department of Chemistry who was accomplished in the field of physical organic chemistry and free radicals, died on Saturday, March 22. He had been a member of the MIT community for over 70 years.

Daniel Kleppner, a highly honored physicist who developed technologies that helped pave the way for the Global Positioning System and whose foundational atomic discoveries helped open up the field of quantum computing, died June 16. He was 92. Kleppner spent nearly four decades as a professor at the Massachusetts Institute of Technology. On the MIT faculty starting in 1966, Dr. Kleppner conducted some of the first research on Rydberg atoms — a highly excited atom that shares the simple properties that define hydrogen. His seminal paper published in 1976 jump-started interest in the field. In 1998, Dr. Kleppner and his team created a Bose-Einstein condensate in hydrogen and announced it at a conference to a standing ovation. When he received the National Medal of Science in 2006, Dr. Kleppner was named "the godfather of extra-cold atoms."

Submitted on July 21, 2025
Nergis Mavalvala, Dean, MIT School of Science
Curtis and Kathleen Marble Professor of Astrophysics