

Provost

The academic areas continued to develop new initiatives in research and education in 2017–2018, with several of these efforts designed to advance understanding of the human impact of technology and to foster areas of scholarship that cross disciplinary boundaries and enter new realms of investigation. Development and expansion of the campus's physical resources also proceeded in important areas. This report describes some of the main events and accomplishments in academic and related areas that took place across the Institute during the past year.

People

In August 2017, Professor Karen Gleason announced her decision to step down from her position as associate provost, effective at the end of June 2018, in order to return to teaching and research in the Department of Chemical Engineering. During AY2018, Professor Gleason continued her oversight as associate provost of the Industrial Liaison Program/Industrial Relations and the Technology Licensing Office. As part of a phased succession plan, Krystyn Van Vliet, the Michael (1949) and Sonja Koerner Professor of Materials Science and Engineering and of Biological Engineering, was named to succeed Professor Gleason as associate provost, taking over responsibility from Professor Gleason for space planning, allocation and renovation during 2017–2018 and then assuming responsibility for the associate provost's full portfolio beginning July 2018.

Effective September 1, 2017, Krishna Rajagopal, the William A. M. Burton Professor in the Department of Physics, was appointed dean for digital learning, reporting to the vice president for open learning, with a focus on working with departments and faculty for the development and execution of digital teaching strategies. Professor Rajagopal served as chair of the MIT faculty from 2015 to 2017.

Also in September, Whitney Espich began her position as chief executive officer of the MIT Alumni Association, succeeding Judith Cole, who had announced her retirement in spring 2017. Ms. Espich previously was executive director of communications, events, and donor relations in the Office of Resource Development. In her new role, she works closely with the president of the Alumni Association.

In March 2018, Vladimir Bulović, the Fariborz Maseeh (1990) Professor of Emerging Technology in the Department of Electrical Engineering and Computer Science, was named the inaugural director of MIT.nano, a new laboratory dedicated to the research and fabrication of nanoscale materials and processes.

In April 2018, MIT announced that Professor Edmund Bertschinger would step down after five years of service as Institute Community and Equity Officer (ICEO). He transitioned out of this role in June, at which time he began a sabbatical. Professor Bertschinger was the first person to hold the position as the ICEO, which was created in 2013 in order to advance activities and discussions related to community-building, equity, inclusion, and diversity among students, faculty, and staff. A search was begun to identify a faculty member to succeed Professor Bertschinger. Alyce Johnson, manager of staff diversity and inclusion in the Department of Human Resources, was named interim ICEO beginning July 2018.

Also in June, MIT announced that John Charles, vice president for information systems and technology, decided to retire at the end of this calendar year, following five years of service to the Institute in this role. The Office of the Executive Vice President and Treasurer will manage the search process to identify a successor.

We were deeply saddened by the deaths this past year of Paul Gray, former MIT president; Gene Brown, former dean of the School of Science; John de Monchaux, former dean of the School of Architecture and Planning; and Morris Halle, Institute Professor Emeritus.

Academic Programs and Activities

New activities in the academic areas continued to emerge throughout the year, reflecting the Institute's goals of continually improving its educational programs and engaging both nationally and globally to foster innovative research. A sample of these activities is provided below. Please refer to the separate reports of individual academic areas for detailed information about these and other programs.

In July 2017, the provost appointed an ad hoc task force on open access to MIT's research. Forming a task force on this issue was among the recommendations of the 2016 report of the Future of Libraries Task Force. While MIT adopted a formal open access policy in 2009, the new task force will lead Institute-wide discussions on ways to update the current policy to promote the sharing of MIT's advances in research and scholarship as widely as possible. In addition, the task force will explore open access policies at peer institutions and other organizations to help determine best practices. The open access task force will be led by Hal Abelson, Class of 1922 Professor of Electrical Engineering and Computer Science, and Chris Bourg, director of Libraries.

In September, MIT announced the launch of its new collaboration with IBM on artificial intelligence (AI), providing the Institute with additional resources devoted to advanced AI research as well as an industrial partner who can help translate research outcomes into practical applications. This ten-year agreement is intended to lead to the formation of the MIT-IBM Watson AI Lab, where researchers from MIT and IBM will work together across a range of areas related to artificial intelligence. Antonio Torralba, professor of electrical engineering and computer science, and an expert in computer vision, machine learning, and human visual perception, was named the MIT director of the new lab.

In February, the Institute announced the formation of the MIT Quest for Intelligence, a campus-wide initiative to understand the foundations of intelligence and to promote the development of technological tools that can make a positive impact on society. The Quest will have two main branches of activity: "The Core," which will focus on the science of human and machine intelligence, where a key output will be machine learning algorithms; and "The Bridge," which will be dedicated to the application of discoveries in natural and artificial intelligence to any discipline by providing state-of-the-art tools, including intelligence technologies, platforms, and infrastructure designed to enhance research methods. Examples of possible areas of research that could benefit from these efforts include disease diagnosis, drug discovery, materials and manufacturing design, automated systems, synthetic biology, and finance. Researchers will also investigate the societal and ethical implications of advanced analytical and predictive tools. Faculty

and research staff from all five MIT schools are expected to participate in The Quest's activities. It was announced in June that Professor Antonio Torralba would be the inaugural director of The Quest.

Also in February, the provost announced the formation of the MIT Task Force on the Work of the Future, which will focus on the relationship between technological innovation and the changing nature of work. Key goals of this effort will be to increase understanding of the social and human implications of technology and to help inform the national conversation on this topic. Specifically, the task force is charged with addressing three questions:

- How are emerging technologies transforming the nature of human work and the skills that enable people to thrive in the digital economy?
- How can we shape and catalyze technological innovation to complement and augment human potential?
- How can our civic institutions—existing and new—ensure that the gains from these emerging innovations contribute to equality of opportunity, social inclusion, and shared prosperity?

The task force consists of a combined faculty and student research team of more than 20 members, drawing from deep expertise in various areas of technology, social science, and public policy studies, along with several other areas. The task force leadership team consists of David Autor, the Ford Professor of Economics and associate head of the MIT Department of Economics; David Mindell, the Frances and David Dibner Professor of the History of Engineering and Manufacturing and a professor of aeronautics and astronautics; and Elisabeth Reynolds, executive director of the MIT Industrial Performance Center and a lecturer in the Department of Urban Studies and Planning. Task force members also expect to work with community leaders in industry, government, labor, education, and the non-profit sector to draw on these outside perspectives.

In April, five working groups charged with guiding the development of policies and procedures for MIT's engagement with The Engine, an external innovation accelerator that was launched in 2016, submitted final reports. Over 60 members of the MIT community participated in an effort organized around the following working groups: Facilities Access; New Models for Technology Licensing; Conflict of Interest; Visas for MIT Entrepreneurs; and MIT's Innovation Ecosystem. Key recommendations from the reports include the creation of a function within the MIT Innovation Initiative to oversee the interface between MIT and The Engine, the development of new standard agreements for technology licensing and intellectual property, the formation of an Institute-level conflict of interest committee, efforts to help international entrepreneurs obtain legal advice on immigration matters, and the creation of a pilot master's of innovation degree. An implementation framework for these activities will be developed by the MIT Innovation Initiative.

The Institute announced a number of new academic programs this past year.

In March 2018, MIT launched a new MITx MicroMasters program in principles of manufacturing. This program will focus on core concepts of the manufacturing environment. It will consist of online courses in the areas of process control, manufacturing systems, engineering management, and supply chain management and design. The program is intended to enable engineers, product designers, and technology developers to advance their careers. Those students who complete the online MicroMasters credential will be eligible to apply to the Master of Engineering in Advanced Manufacturing and Design degree program at MIT, and, if accepted, use course credits from the MicroMasters program to accelerate the time to complete the full master's degree.

In April, the MIT Statistics and Data Science Center, part of the Institute for Data, Systems, and Society (IDSS), announced the establishment of two new academic programs: 1) a MicroMasters program in statistics and data science, which will be offered online through edX, giving students worldwide a pathway to earn a professional credential that could lead to the opportunity to complete a PhD at MIT or to accelerate the completion of a full master's degree at another institution, and 2) an interdisciplinary doctoral program in statistics designed for students currently enrolled in a participating MIT doctoral program who wish to expand their studies of statistics in correlation with their chosen field of study. Participating fields of study include aeronautics and astronautics, economics, mathematics, political science, and the IDSS doctoral program in Social and Engineering Systems. Both new programs will begin in fall 2018.

In May, the faculty approved a new SB degree in urban studies and planning with computer science, designed to provide students with new sets of tools and methodologies by bringing large-scale data analysis to bear on complex urban problems. This program will combine urban planning and public policy, design and visualization, data analysis, machine learning and artificial intelligence, pervasive sensor technology, and other aspects of both computer science and city planning in novel ways. A centerpiece of this integration will be the degree's "urban science synthesis lab" requirement whereby intellectual tools will be brought together in comprehensive ways to solve real-world problems.

Solve, MIT's initiative to apply innovation in technology to the world's most pressing problems by bringing together teams of entrepreneurs from around the world, held its flagship annual meeting at MIT in May, Canadian Prime Minister Justin Trudeau was the keynote speaker.

Campus Renewal

In September 2017, a new theater arts facility on Vassar Street (Building W97) opened on schedule, providing consolidation under one roof of several programmatic activities that had become dispersed across campus. Formerly a warehouse, the completely renovated building includes rehearsal space, costume and scene design shops, design and faculty studios, as well as offices, and it is anchored by a two-story theater performance space.

In October, groundbreaking took place for the construction of a new graduate student residence in Kendall Square, representing the first phase of a long-term, mixed-use development project that features the construction of six new buildings on Institute-

owned property in the East Campus/Kendall Square area. The new graduate student facility—being built on the site of Building E39—will contain 454 housing units for MIT graduate students. The building complex will also include a childcare facility, common space for the residents, and an active community and academic space that will feature a 200-seat auditorium and movable walls for flexibility in configuration. Construction of the new facility is planned for completion in 2020.

Also in October, the Cambridge City Council approved MIT's petition to rezone the parcel of land in Kendall Square currently occupied by the John A. Volpe National Transportation Systems Center. A year earlier, the federal government selected MIT as its partner in the redevelopment of the 14-acre property under a plan that includes building a new headquarters for the Volpe Center on approximately four acres of the parcel. Under the agreement, MIT will advance a detailed plan to develop the remaining 10 acres, which is expected to include housing, commercial and lab space, retail establishments, open space, and a variety of community-oriented uses. The Institute's zoning petition resulted from a collaborative process involving the MIT community, residents from abutting neighborhoods, the Cambridge Planning Board, city staff, and the Cambridge City Council.

As part of the Institute's comprehensive renewal of student housing, construction began this past year on a new undergraduate residence hall on the former site of the West Garage parking facility on Vassar Street. As part of a plan to house more students near the heart of campus, the residence hall will add 450 beds and 12 graduate resident tutor apartments; it will also include a dining facility. The building has a target completion date of fall 2020.

Construction was brought to completion this year on MIT.nano—a 200,000-square-foot central-campus facility dedicated to nanoscale materials and processes. The MIT community was invited to tour the new facility in June, with the formal opening anticipated for October 2018.

Faculty

Nineteen faculty members retired from MIT in 2017–2018, while faculty recruitment continued at a strong pace. A total of 49 new faculty members (33 men and 16 women, including eight members of underrepresented minority groups) began their MIT appointments during 2017–2018. Also, 21 faculty members (17 men and four women) were awarded tenure within MIT. Most of these promotions were effective July 2018.

The Harold E. Edgerton Faculty Achievement Award is the highest honor bestowed by the MIT faculty on one of its own junior faculty members. The Edgerton Award, a tribute to the late beloved inventor and photographer Harold “Doc” Edgerton, recognizes exceptional distinction in teaching and research. In April, the award was presented to Vinod Vaikuntanathan, associate professor in the Department of Electrical Engineering and Computer Science.

The James R. Killian, Jr. Faculty Achievement Award is a special honor bestowed by the MIT faculty on one of its own members. The award was established in 1971 “to recognize extraordinary professional accomplishments by full-time members of the MIT

faculty.” In May, it was announced that Gerald Fink, the Margaret and Herman Sokol Professor in Biomedical Research and American Cancer Society Professor of Genetics, was selected as the Killian Award recipient.

Four faculty members were appointed Margaret MacVicar Faculty Fellows this year in recognition of their outstanding contributions to the quality of undergraduate education at MIT. The 2018 awardees are: David Autor, the Ford Professor of Economics and associate head of the Department of Economics; Christopher Capozzola, professor of history; Shankar Raman, professor of literature; and Merritt Roe Smith, the Leverett and William Cutten Professor of the History of Technology in the Department of History and the Program in Science, Technology and Society. MacVicar Faculty Fellows are appointed for 10-year terms. These awardees bring the total number of active fellows to 39, along with approximately 50 emeritus fellows remaining at MIT, who together form a cohort of scholars committed to excellent teaching and innovation in education.

The Dr. Martin Luther King, Jr. Visiting Professors and Scholars Program was established in 1995 to recognize the many contributions of outstanding minority scholars in the academy, as well as to enhance their scholarship through intellectual interactions with MIT peers and enrich the intellectual life of the Institute through their participation in MIT research and academic programs. The 2017–2018 MLK visiting professors were Kimberly J. Brown, visiting assistant professor, Women’s and Gender Studies, and Literature; Anita Hill, visiting professor, Research Laboratory of Electronics; and Kenda Mutongi, visiting professor, History. In addition, two MLK visiting scholars were sponsored by the program: Garnette Cadogan, Urban Studies and Planning; and Duane M. Lee, Physics.

The following represent a sample of the numerous faculty who were honored with outside awards or appointments this past year.

Four faculty members were elected to the National Academy of Sciences: Amy Finkelstein, the John and Jennie S. MacDonald Professor of Economics; Mehran Kardar, the Francis Friedman Professor of Physics; Xiao-Gang Wen, the Cecil and Ida Green Professor of Physics; and Feng Zhang, the Patricia and James Poitras ’63 Professor of Neuroscience within the Departments of Brain and Cognitive Sciences and Biological Engineering respectively.

Four faculty members were elected this year to the National Academy of Engineering: Lallit Anand, the Warren and Towneley Rohsenow Professor of Mechanical Engineering; Angela Belcher, the James Mason Crafts Professor of Biological Engineering and Materials Science and Engineering; Stephen Graves, the Abraham Siegel Professor of Management Science and a professor of engineering systems and mechanical engineering in the Sloan School of Management; and Yang Shao-Horn, the Keck Professor of Energy in the Department of Mechanical Engineering and Department of Materials Science and Engineering

Eight faculty members were elected to the American Academy of Arts and Sciences: Alexei Borodin, professor of mathematics; Gang Chen, the Carl Richard Soderberg Professor of Power Engineering and then head of the Department of Mechanical Engineering; Lawrence Guth; professor of mathematics; Parag Pathak, the Jane Berkowitz

Carlton and Dennis William Carlton Professor of Microeconomics; Nancy Rose, the Charles P. Kindleberger Professor of Applied Economics and head of the Department of Economics; Leigh Royden, professor of earth, atmospheric, and planetary sciences; Sara Seager, the Class of 1941 Professor in the Department of Earth, Atmospheric, and Planetary Sciences with a joint appointment in the Department of Physics; and Feng Zhang, the James and Patricia Poitras '63 Professor of Neuroscience within the Departments of Brain and Cognitive Sciences and Biological Engineering respectively.

Rainer Weiss '55, PhD '62, professor emeritus of physics, won the Nobel Prize in physics for 2017.

Arup Chakraborty, the Robert T. Haslam Professor of Chemical Engineering, was elected to the National Academy of Medicine.

Regina Barzilay, the Delta Electronics Professor of Electrical Engineering and Computer Science, and a member of the Computer Science and Artificial Intelligence Laboratory, was a recipient of a 2017 MacArthur Fellowship.

Feng Zhang was the recipient of the 2017 Lemelson-MIT Prize, the largest cash prize for invention in the United States

Joan Jonas, professor emerita in the Program in Art, Culture and Technology, was a recipient of the 2018 Kyoto Prize, Japan's highest private award, for her lifetime of accomplishments and global influence as an artist.

Graduate Student Fellowships

The Presidential Graduate Fellowship Program provides full financial support to many of the Institute's most promising first-year graduate students. In AY2018, this program awarded a total of 115 fellowships over a wide range of MIT's academic departments. Following is a list of existing fellowships that are named for individual and corporate donors, some indicating specific areas of support that have been designated by the donor.

Edward A. Abdun-Nur '24

Akamai Technologies, Inc. (Mathematics and Electrical Engineering and Computer Science)

Agencourt Bioscience Corporation /Alnylam Pharmaceuticals

Ashar Aziz (1981)

Homer A. Burnell (Architecture and Urban Planning)

Richard A. Denton

Martin Deutsch

Morton E. Goulder (1942)

Herbert and Dorothy Grier

Robert T. Haslam (Chemistry and Chemical Engineering)

Heising-Simons Foundation
 Irwin Mark Jacobs and Joan Klein Jacobs
 J. Kenneth Jamieson
 Grayce B. Kerr Fund in honor of Charles M. Vest
 The Kurtz Family Foundation in honor of Charles M. Vest
 James A. Lash
 William M. Layson (Physics)
 Liberty Mutual Foundation
 Edward H. Linde (Civil and Environmental Engineering)
 Curtis Marble
 Samuel H. and Luleta Maslak
 Momenta Pharmaceuticals
 Neurometrix, Inc.
 The Picower Foundation in honor of Norman B. Leventhal
 Charles A. Piper
 Praecis Pharmaceuticals, Inc. (Biology and the School of Science)
 Walter A. Rosenblith
 Kenan Sahin (Humanities, Arts, and Social Sciences)
 Henry E. Singleton (Brain and Cognitive Sciences)
 Stata Family Presidential Fellowship Fund
 Craig and Rose Tedman for Robert M. Rose
 Edward Clark Walsh (Chemical Engineering)
 David S.Y. (1962) and Harold Wong

In addition, five students held Provost's Women and Minority Fellowships, which are considered to be a part of the Presidential Graduate Fellowship Program.

The Lemelson Foundation provided funding for eight underrepresented minority students with interests in engineering innovation; these fellowships were intended for incoming students. The School of Engineering designates the Lemelson Foundation Fellowships as part of the Presidential Graduate Fellowship Program.

In order to build community among fellows, the Society of Presidential Fellows hosted a lecture and dinner series co-sponsored by the Sidney-Pacific Graduate Residence.

Fundraising for the support of the Presidential Fellowship Program continues to be a high priority of the Institute.

Diversity, Inclusion, and Community

We continued in the past year to develop and encourage activities that strengthen the diversity of the Institute's community. Much of this effort was coordinated by the Institute Community and Equity Office, which serves as a resource to department heads, school deans, and other Institute leaders, as well as to the community at large, on matters related to diversity and inclusion.

In fall 2017, a new subject, 21H.S01 MIT and Slavery, was introduced by Professor Craig Wilder of the History Section. He co-taught the course with Nora Murphy, archivist for researcher services at the MIT Libraries. The creation of this subject resulted from inquiries about MIT and slavery in the broader context of historical connections of institutions of higher education with slavery.

In January 2018, the Institute initiated an online sexual misconduct prevention training program for all faculty and staff in an effort to raise the awareness of shared community responsibility to prevent and respond to misconduct in all its different forms. Virtually 100% participation of faculty and staff was achieved. Various MIT community events on sexual misconduct will continue into the future to maintain ongoing awareness of this issue.

In March, the provost provided his annual report on the recruitment and retention of underrepresented minority and women faculty and students, a report given annually since 2004. The report noted that the provost's office has been working with the school deans to assess programs across MIT that aim to enhance diversity, in order to determine areas where increased efforts could lead to stronger diversity outcomes. The report also described additional efforts underway to continually build a more welcoming and diverse community at MIT. For example, the Institute's Mind-Hand-Heart program has worked throughout the year with academic leadership across the Institute towards promoting a healthy and welcoming academic climate within departments.

Finances

MIT tuition was increased by 3% to \$49,580 in AY2018. The Institute remains committed to a policy of need-blind admissions and to meeting the full financial need of all the undergraduates it admits. Approximately 59% of undergraduates received need-based MIT scholarship aid in the past year and 31% of undergraduates attended tuition-free. The undergraduate financial aid budget was increased by \$4.3 million, or 3.8%, in fiscal year 2018 to help offset the increase in tuition and recent decreases in expected parental contribution. The graduate financial aid budget was increased by \$7.9 million, or 3.8%. The Institute's undergraduate enrollment was 4,547, an increase of 23 students from 2016-2017, while graduate student enrollment increased by 67 to 6,919.

Ten million dollars was made available in fiscal year 2018 for new academic (\$7 million) and administrative (\$3 million) programs, similar to the previous year's allocation. There was no operating surplus at the end of FY2018.

The market value of investments in the Institute's endowment as of June 30, 2018 was \$16.4 billion, representing an increase of 10.6% over the June 30, 2017 value of \$14.8 billion.

Research

Expenditures on sponsored research conducted on campus totaled \$731.5 million in FY2018, representing an increase of 1.7% over the 2017 volume of \$719.5 million.

The federal government continues to be the largest sponsor of campus research funding, accounting for approximately 62.1% of the total volume. Industrial entities continued for the second straight year to represent the single largest sponsor of campus research, with an approximate 19.7% share of total research expenditures. The National Institutes of Health and other agencies within the Department of Health and Human Services accounted for approximately 17.9% of total research expenditures, followed by the Department of Defense (16.9%), private foundations and nonprofit organizations (12.9%), the National Science Foundation (11.1%), and the Department of Energy (10.0%).

Lincoln Laboratory research volume was \$973.4 million in FY2018, an increase of 0.2% above the 2017 volume of \$971.3 million.

Martin A. Schmidt
Provost