1 MIT Facts and History

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MIT Facts and History

The Massachusetts Institute of Technology is one of the world's preeminent research universities, dedicated to advancing knowledge and educating students in science, technology, and other areas of scholarship that will best serve the nation and the world. It is known for rigorous academic programs, cutting-edge research, a diverse campus community, and its longstanding commitment to working with the public and private sectors to bring new knowledge to bear on the world's great challenges.

William Barton Rogers, the Institute's founding president, believed that education should be both broad and useful, enabling students to participate in "the humane culture of the community," and to discover and apply knowledge for the benefit of society. His emphasis on "learning by doing," on combining liberal and professional education, and on the value of useful knowledge continues to be at the heart of MIT's educational mission.

MIT's commitment to innovation has led to a host of scientific breakthroughs and technological advances. Achievements of the Institute's faculty and graduates have included the first chemical synthesis of penicillin and vitamin A, the development of inertial guidance systems, modern technologies for artificial limbs, and the magnetic core memory that enabled the development of digital computers. Exciting areas of research and education today include neuroscience and the study of the brain and mind, bioengineering, energy, the environment and sustainable development, information sciences and technology, new media, financial technology, and entrepreneurship.

University research is one of the mainsprings of growth in an economy that is increasingly defined by technology. A study released in February of 2009 by the Kauffman Foundation revealed that MIT graduates had founded 25,800 active companies. These firms employed about 3.3 million people, and generated annual world sales of $2 trillion, or the equivalent of the eleventh-largest economy in the world.

MIT has forged educational and research collaborations with universities, governments, and companies throughout the nation and world, and draws its faculty and students from every corner of the globe. The result is a vigorous mix of people, ideas, and programs dedicated to enhancing the world's well-being.

People

Total MIT-affiliated people in Massachusetts	50,000+
Employees	14,127
Cambridge Campus	10,775
Lincoln Laboratory	3,352
Students	10,894
Alumni in Masssachusetts	Approximately 20,000

Economic Information

Total MIT Expenditures in FY 2011	$2.6 billion

Federal Research Expenditures

Cambridge campus (MIT FY 2011)	$661 million
Lincoln Laboratory* (MIT FY 2011)	$806 million
SMART* (MIT FY 2011)	$23 million
Total (MIT FY 2011)	**$1.49 billion**

*Totals do not include research performed by Campus Laboratories for Lincoln Lab and Singapore-MIT Alliance for Research and Technology ("SMART")

Payroll, including Lincoln Laboratory, and SMART (FY 2011)	$1.01 billion

Technology Licensing Office

The Technology Licensing Office (TLO) manages the patenting and licensing process for MIT, Lincoln Laboratory, and the Whitehead Institute. The TLO aims to benefit the public by moving results of MIT research into societal use via technology licensing.

Statistics for FY 2011

Total number of inventions disclosures	632
Number of U.S. new utility patent applications filed	187
Number of U.S. patents issued	153
Number of licenses and options granted (not including trademarks and end-use software)	79
Number of options granted (not including options as part of research agreements)	34
Number of software end-use licenses granted	21
Number of companies started (venture capitalized and/or with a minimum of $500K of other funding)	26

Students

The Institute's student body of 10,894 is highly diverse. Students come from all 50 states, the District of Columbia, three territories and dependencies, and 115 foreign countries. U.S. minority groups constitute 50 percent of undergraduates and 20 percent of graduate students. The Institute's 2,909 international students make up 10 percent of the undergraduate population and 38 percent of the graduate population. For more information about international students at MIT, see pages 86-88.

Student Profile 2011-2012

Undergraduate	4,384
Graduate	6,510
Total	10,894

Undergraduate
45 percent female 55 percent male

Graduate
32 percent female 68 percent male

In Fall 2011, 44 percent of MIT's first-year students (who submitted their class standing) were first in their high school class; 90 percent ranked in the top 5 percent.

Members of U.S. minority groups: 3,495

	Undergraduate*	Graduate*
African American	302	124
Asian American	1,055	760
Hispanic American	649	303
Native American	25	15
Native Hawaiian or other Pacific Islander	1	0
Two or more races	146	115
Total	**2,178 (50%)**	**1,317 (20%)**

*These figures may not precisely reflect the population because they are self-reported, and not all students choose to identify an ethnicity or race. 117 undergraduates and 535 graduate students chose not to identify an ethnicity or race.

Faculty, Staff, and Trustees

Faculty/Staff 2010-2011

Faculty	1,018
Other academic and instructional staff	883
Research staff and research scientists (includes postdoctoral positions)	3,008
Administrative staff	2,328
Support staff	1,478
Service staff	795
Medical clinical staff	98
Affiliated faculty, scientists, and scholars	1,167
Total campus faculty and staff	**10,775**

In addition, approximately 500 graduate students serve as teaching assistants or instructors, and 2,450 graduate students serve as research assistants.

MIT Lincoln Laboratory employs about 3,000 people, primarily at Hanscom Air Force Base in Lexington, Massachusetts.

Faculty Profile

63 percent hold the rank of Full Professor
21 percent hold the rank of Associate Professor
16 percent hold the rank of Assistant Professor

77 percent of faculty are tenured

Professors	647
Associate professors	210
Assistant professors	161
Total	**1,018**

Faculty with dual appointments 40

64 percent of the faculty are in Science and Engineering fields.

School	Faculty
Architecture and Planning	76
Engineering	372
Humanities, Arts, and Social Sciences	164
Science	273
Sloan School of Management	112
Whitaker College and all others	21

Gender	Faculty	Percent
Male	801	79
Female	217	21

Minority Group Representation

18 percent of faculty are members of a minority group; 6.2 percent are members of an underrepresented minority.*

American Indian or Alaskan Native
1 female 2 males

Black or African American
9 females 25 males

Hispanic
4 females 30 males

Asian
31 females 99 males

*Some faculty members identify as part of multiple groups.

Degrees

In 2010-2011, MIT awarded 3,317 degrees:

Doctoral degrees	609
Master’s degrees	1,530
Professional Engineer degrees	17
Bachelor of Science degrees	1,161

Nearly half of 2010-2011 graduates from MIT Ph.D. programs planned to stay in Massachusetts after completing their studies, according to the annual Doctoral Student Exit Survey. Conducted by the Office of the Provost/Institutional Research, the survey found that 43.3 percent of respondents intended to remain in the Bay State. This compares to roughly 9.8 percent of those earning degrees who indicated they attended high school in Massachusetts — a rough gauge of who among degree recipients were native to the state.

Alumni

MIT’s 123,821 alumni are connected to the Institute through graduating-class events, departmental organizations, and over 47 clubs in the United States and 42 abroad. More than 10,239 volunteers offer their time, financial support, and service on committees and on the MIT Corporation, the Institute’s Board of Trustees. MIT graduates hold leadership positions in industries and organizations around the world. An estimated 20,000 alumni reside in Massachusetts, and about 87 percent of MIT’s alumni live in the United States.

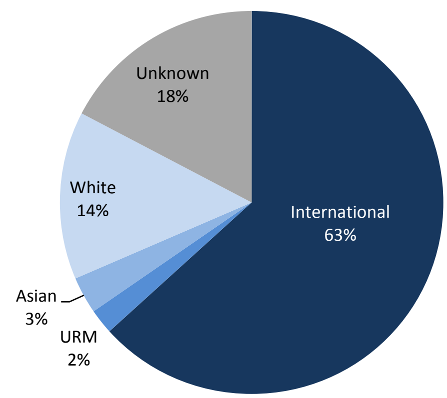
Postdoctoral Appointments

In 2011, MIT hosted more than 1,000 postdoctoral associates and fellows. These individuals work with faculty in academic departments, laboratories, and centers.

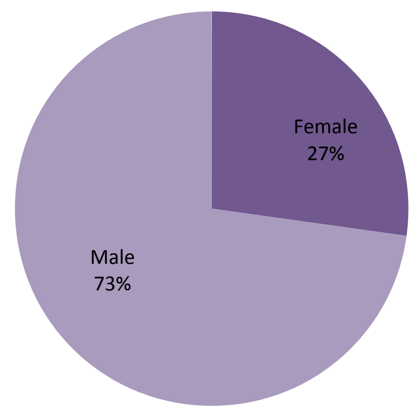
As of October 31, 2011	
American Indian or Alaskan Native	1
Black or African American	5
Hispanic or Latino	23
Total URM	**29**
Asian	43
White	195
International	870
Unknown	238
Total	**1,375**
Female	374
Male	998

Country of Citizenship	Count	Percent of Total
China	179	20
Rep. of Korea	78	9
India	71	8
Germany	66	8
Canada	62	7
Israel	36	4
Spain	35	4
France	32	4
Italy	32	4
Japan	24	3
All Others	255	29
Total	**870**	

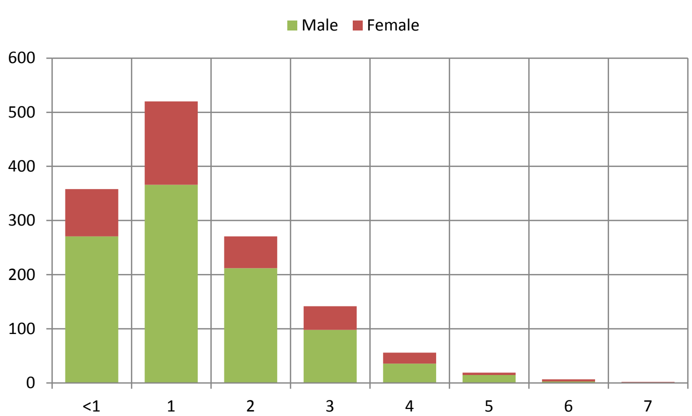
Ethnicity of Postdoctoral Associates and Fellows



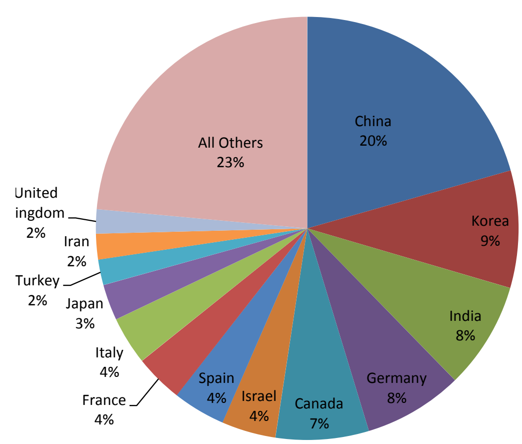
Gender of Postdoctoral Associates and Fellows



Years at MIT
All Postdoctoral Associates and Fellows



Country of Citizenship of International Postdoctoral Associates and Fellows



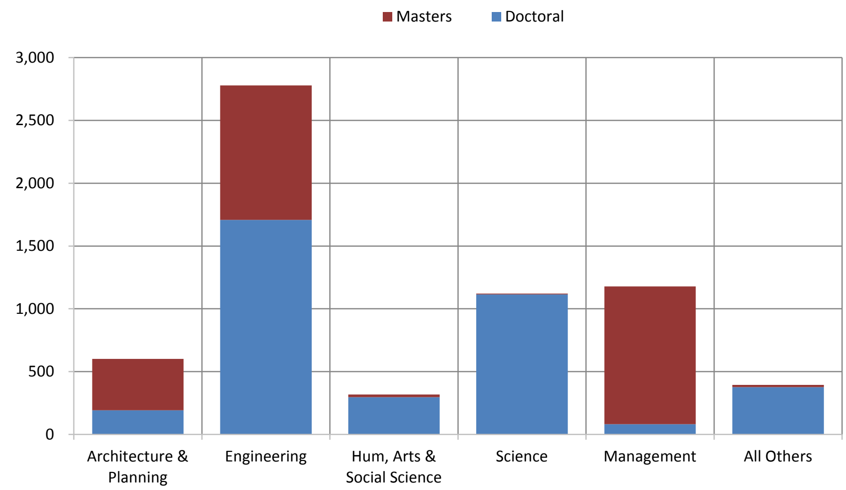
Graduate Students

As of October 31, 2011 there were 6,510 graduate students at MIT—2,626 masters students and 3,732 doctoral students.

Citizenship	Count
U.S. Citizen	3,757
U.S. Permanent Resident	296
International	2,457
Total	**6,510**

Graduate Level	Count
Doctoral	3,732
Masters	2,626

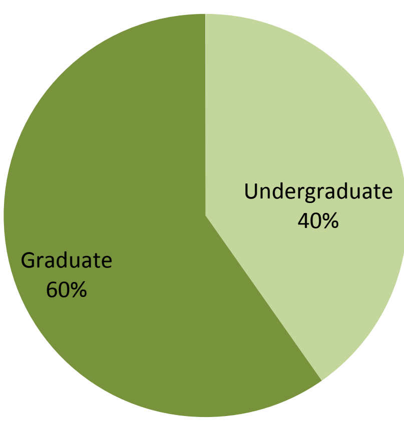
Graduate Students by School and Degree Level



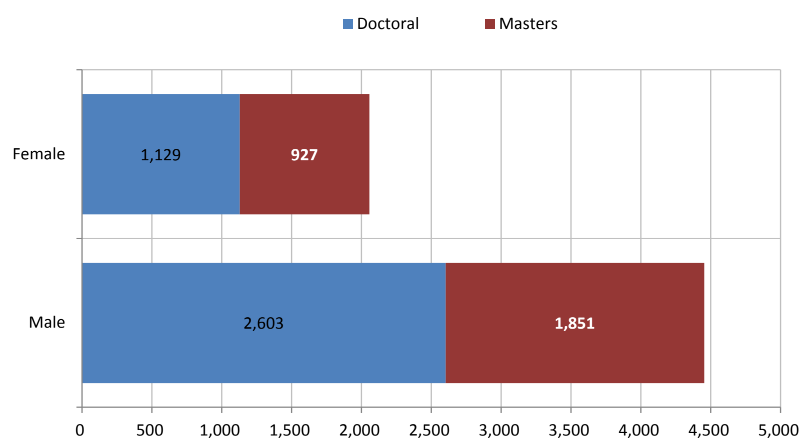
	Graduate Level		
School Name	Doctoral	Masters	Grand Total*
Architecture and Planning	192	409	601
Engineering	1,708	1,071	2,779
Humanities, Arts & Social Sciences	269	22	291
Science	1,115	7	1,122
Management	81	1,098	1,179
All Others	367	19	386
Grand Total	3,732	2,626	6,358

*excludes non-matriculating students

Graduate Students as a Percentage of the Total Student Population



Graduate Students by Gender and Degree Level



Awards and Honors of Current Faculty and Staff

There are currently 8 faculty members at MIT who have received the Nobel Prize:

Robert H. Horvitz	Nobel Prize in medicine/physiology
Wolfgang Ketterle	Nobel Prize in physics
Robert C. Merton	Nobel Memorial Prize in Economic Sciences
Phillip A. Sharp	Nobel Prize in medicine/physiology
Richard R. Schrock	Nobel Prize in chemistry
Susan Solomon	Nobel Peace Prize, co-chair of IPCC Working Group One recognized under Intergovernmental Panel on Climate Change (IPCC) - shared
Samuel C. C. Ting	Nobel Prize in physics
Susumu Tonegawa	Nobel Prize in medicine/physiology
Frank Wilczek	Nobel Prize in physics

Award Name	Award Agency	Recipients
A. M. Turing Award	Association for Computing Machinery	3
Alan T. Waterman Award	National Science Foundation	3
American Academy of Arts and Sciences Member	American Academy of Arts and Sciences	137
American Association for the Advancement of Science Fellow	American Association for the Advancement of Science	97
American Philosophical Society Member	American Philosophical Society	14
American Physical Society Fellow	American Physical Society	77
American Society of Mechanical Engineers Fellow	American Society of Mechanical Engineers	15
Association for Computing Machinery Fellow	Association for Computing Machinery	23
Dirac Medal	Abdus Salam International Centre for Theoretical Physics	4
Fulbright Scholar	Council for International Exchange of Scholars (CIES)	6
Gairdner Award	Gairdner Foundation	7
Guggenheim Fellow	John Simon Guggenheim Memorial Foundation	71
HHMI Alumni Investigator	Howard Hughes Medical Institute (HHMI)	2
HHMI Early Career Scientist	Howard Hughes Medical Institute (HHMI)	3
HHMI Investigator	Howard Hughes Medical Institute (HHMI)	16
HHMI Professor	Howard Hughes Medical Institute (HHMI)	2
IEEE Fellow	Institute of Electrical and Electronics Engineers, Inc. (IEEE)	54
Institute of Medicine Member	National Academies	34
Japan Prize	Science and Technology Foundation of Japan	1
John Bates Clark Medal	American Economic Association	3
John von Neumann Medal	Institute of Electrical and Electronics Engineers, Inc. (IEEE)	3
MacArthur Fellow	John D. and Catherine T. MacArthur Foundation	20
Millennium Technology Prize	Millennium Prize Foundation	2
National Academy of Engineering Member	National Academies	68
National Academy of Sciences Member	National Academies	77
National Medal of Science	National Science & Technology Medals Foundation	10
National Medal of Technology and Innovation	National Science & Technology Medals Foundation	1
Presidential Early Career Awards for Scientists and Engineers (PECASE)	Executive Office of the President, Office of Science and Technology Policy	28
Pulitzer Prize	Pulitzer Board	3
Rolf Nevanlinna Prize	International Mathematical Union (IMU)	2
Royal Academy of Engineering Fellow	Royal Academy of Engineering	5
Von Hippel Award	Materials Research Society	1

Mildred Dresselhaus

2010 Enrico Fermi Award

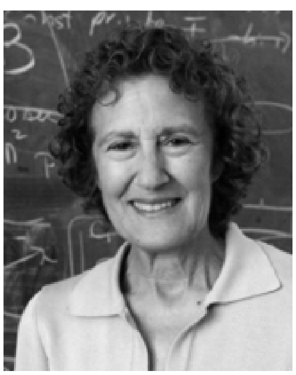
Dresselhaus received the award, one of the government's oldest and most prestigious awards for scientific achievement, along with Stanford University's Burton Richter. In its 2012 official award citation, the White House said Dresselhaus was selected for the Fermi Award "for leadership in condensed matter physics, in energy and scientific policy, in service to the scientific community, and in mentoring women in the sciences."

http://science.energy.gov/fermi/award-laureates/2000s/dresselhaus/

Susan Lindquist
2010 National Medal of Science

Lindquist received the award, the nation's highest science honor, "For her studies of protein folding, demonstrating that alternative protein conformations and aggregations can have profound and unexpected biological influences, facilitating insights in fields as wide-ranging as human disease, evolution, and biomaterials."

http://www.nsf.gov/od/nms/recip_details.cfm?recip_id=5300000000465



Barbara Liskov
2008 A. M. Turing Award

Liskov received the award for her pioneering "contributions to practical and theoretical foundations of programming language and system design, especially related to data abstraction, fault tolerance, and distributed computing." Liskov is the second woman ever to receive the award, which is often described as the "Nobel Prize in Computing."

http://awards.acm.org/citation.cfm?id=1108679&srt=year&year=2008&aw=140&ao=AMTURING&yr=2008

Peter Diamond, professor emeritus
2010 Nobel Prize in Economic Sciences

Diamond received the award along with two co-winners, Dale T. Mortensen of Northwestern University and Christopher A. Pissarides of the London School of Economics and Political Science. Diamond received the award for his analysis of the foundations of search markets. His model helps explain the ways in which unemployment, job vacancies, and wages are affected by regulation and economic policy.

http://nobelprize.org/nobel_prizes/economics/laureates/2010/press.html

Fields of Study

MIT supports a large variety of fields of study, from science and engineering to the arts. MIT's five academic schools are organized into departments and other degree-granting programs. In addition, several programs, laboratories, and centers cross traditional boundaries and encourage creative thought and research.

School of Architecture and Planning

Architecture
Program in Media Arts and Sciences
Center for Real Estate
Urban Studies and Planning

School of Engineering

Aeronautics and Astronautics
Biological Engineering
Chemical Engineering
Civil and Environmental Engineering
Electrical Engineering and Computer Science
Engineering Systems Division
Materials Science and Engineering
Mechanical Engineering
Nuclear Science and Engineering

School of Humanities, Arts, and Social Sciences

Anthropology
Comparative Media Studies
Economics
Foreign Languages and Literatures
History
Linguistics and Philosophy
Literature
Music and Theatre Arts
Political Science
Science, Technology, and Society
Writing and Humanistic Studies

Sloan School of Management

Management Science
- Finance
- Information Technology
- Marketing Science
- Operations Research

School of Science

Biology
Brain and Cognitive Sciences
Chemistry
Earth, Atmospheric, and Planetary Sciences
Mathematics
Physics

Interdisciplinary Educational Programs

Computational and Systems Biology
Computation for Design and Optimization
Energy Studies, Minor
Harvard-MIT Division of Health Sciences and Technology
Leaders for Global Operations
Microbiology
Operations Research
Program in Polymer Science and Technology
MIT-Woods Hole Joint Program in Oceanography and Applied Ocean Science and Engineering
Women's Studies

Major Research Laboratories, Centers, and Programs

In addition to teaching and conducting research within their departments, MIT faculty, students, and staff work in MIT's interdisciplinary laboratories.

These include the following:

Center for Advanced Visual Studies
http://cavs.mit.edu/

Center for Biomedical Engineering
http://web.mit.edu/cbe/www/

Center for Biomedical Innovation
http://web.mit.edu/cbi/

Center for Clean Water and Clean Energy at MIT and KFupm
http://cci.mit.edu/

Center for Collective Intelligence
http://cci.mit.edu/

Center for Computational Research in Economics and Management Science
http://mitsloan.mit.edu/research/computational.php

Center for Digital Business
http://ebusiness.mit.edu/

Center for Educational Computing Initiatives
http://ceci.mit.edu/

Center for Energy and Environmental Policy Research
http://web.mit.edu/ceepr/www/

Center for Environmental Health Sciences
http://cehs.mit.edu/

Center for Future Civic Media
http://civic.mit.edu/

Center for Global Change Science
http://web.mit.edu/cgcs/www/

Center for Gynepathology Research
http://web.mit.edu/cgr/

Center for Innovation in Product Design
http://dspace.mit.edu/handle/1721.1/3764

Center for International Studies
http://web.mit.edu/cis

Center for Materials Research in Archaeology and Ethnology
http://http://web.mit.edu/cmrae/index.html

Center for Materials Science and Engineering
http://web.mit.edu/cmse/

Center for Real Estate
http://web.mit.edu/cre/

Center for Technology, Policy, and Industrial Development
http://engineering.mit.edu/research/labs_centers_programs/ctpid.php

Center for Transportation and Logistics
http://engineering.mit.edu/research/labs_centers_programs/ctl.php

Clinical Research Center
http://web.mit.edu/crc/www/

Community Innovators Laboratory
http://web.mit.edu/colab/

Computer Science and Artificial Intelligence Laboratory
http://csail.mit.edu/

The Dalai Lama Center for Ethics and Transformative Values
http://thecenter.mit.edu/

Deshpande Center for Technological Innovation
http://web.mit.edu/deshpandecenter/

Division of Comparative Medicine
http://web.mit.edu/comp-med/

Francis Bitter Magnet Laboratory
http://web.mit.edu/fbml/

Haystack Observatory
http://www.haystack.mit.edu

Institute for Soldier Nanotechnologies
http://web.mit.edu/isn/

Joint Program on the Science and Policy of Global Change
http://globalchange.mit.edu/

David H. Koch Institute for Integrative Cancer Research
http://web.mit.edu/ki/

Major Research Laboratories, Centers, and Programs (continued)

Knight Science Journalism Fellows Program
http://web.mit.edu/knight-science/

Laboratory for Financial Engineering
http://lfe.mit.edu/

Laboratory for Information and Decision Systems
http://lids.mit.edu/

Laboratory for Manufacturing and Productivity
http://web.mit.edu/lmp/

Laboratory for Nuclear Science
http://web.lns.mit.edu

Lean Advancement Initiative
http://lean.mit.edu/

Legatum Center for Development and Entrepreneurship
http://legatum.mit.edu/

Lemelson-MIT Program
http://web.mit.edu/invent

Materials Processing Center
http://mpc-web.mit.edu/

McGovern Institute for Brain Research
http://mit.edu/mcgovern/

Media Laboratory
http://www.media.mit.edu

Microsystems Technology Laboratory
http://mtlweb.mit.edu

MIT Center for Digital Business
http://digital.mit.edu/

MIT Energy Initiative
http://web.mit.edu/mitei

MIT Entrepreneurship Center
http://entrepreneurship.mit.edu

MIT Kavli Institute for Astrophysics and Space Research
http://space.mit.edu/

MIT Mind Machine Project
http://mmp.cba.mit.edu

MIT-Portugal Program
http://mitportugal.org/

Nuclear Reactor Laboratory
http://web.mit.edu/nrl/www/

Office of Professional Education Programs
http://web.mit.edu/professional/

Operations Research Center
http://web.mit.edu/orc/www/

Picower Institute for Learning and Memory
http://web.mit.edu/picower/

Plasma Science and Fusion Center
http://www.psfc.mit.edu/

Productivity from Information Technology Initiative
http://mitsloan.mit.edu/research/profit/

Research Laboratory of Electronics
http://rle.mit.edu/

Sea Grant College Program
http://seagrant.mit.edu/

SENSEable City Laboratory
http://senseable.mit.edu/

Singapore-MIT Alliance
http://web.mit.edu/sma/

Singapore-MIT Alliance for Research and Technology (SMART) Centre
http://web.mit.edu/SMART/

Spectroscopy Laboratory
http://web.mit.edu/spectroscopy/

System Design and Management Program
http://sdm.mit.edu/

Technology and Development Program
http://web.mit.edu/mit-tdp/www/

Whitaker College of Health Sciences and Technology
http://hst.mit.ed/index.jsp

Women's Studies and Gender Studies Program
http://web.mit.edu/wgs/index.html

MIT Lincoln Laboratory
MIT operates Lincoln Laboratory in Lexington, Massachusetts as an off-campus Federally Funded Research and Development Center focused on technologies for national security.

Academic and Research Affiliations

Alliance for Global Sustainability

Established in 1995, the Alliance for Global Sustainability (AGS) is an international partnership among MIT, the Swiss Federal Institute of Technology, the University of Tokyo, and the Chalmers University of Technology in Sweden. See page 81 for more information.

The Broad Institute of MIT and Harvard

The Broad Institute is founded on two principles – that this generation has a historic opportunity and responsibility to transform medicine, and that to fulfill this mission, we need new kinds of research institutions, with a deeply collaborative spirit across disciplines and organizations. Operating under these principles, the Broad Institute is committed to meeting the most critical challenges in biology and medicine. Broad scientists pursue a wide variety of projects that cut across scientific disciplines and institutions. Collectively, these projects aim to: Assemble a complete picture of the molecular components of life; Define the biological circuits that underlie cellular responses; Uncover the molecular basis of major inherited diseases; Unearth all the mutations that underlie different cancer types; Discover the molecular basis of major infectious diseases; and Transform the process of therapeutic discovery and development. See page 39 for more information. http://www.broadinstitute.org/

Cambridge MIT Institute

The Cambridge-MIT Institute (CMI) is a collaboration between the University of Cambridge and MIT. Funded by British government and industry, CMI's mission is to enhance competitiveness, productivity, and entrepreneurship in the United Kingdom. See page 93 for more information.

Cross-Registration at Other Institutions

MIT has cross-registration arrangements with several area schools, enabling qualified MIT students to take courses at Harvard University, Boston University's African Studies Program, Brandeis University's Florence Heller Graduate School for Advanced Studies in Social Welfare, Massachusetts College of Art, The School of the Museum of Fine Arts, and Tufts University's School of Dental Medicine. MIT also has junior year abroad and domestic year away programs where students may study at another institution in the U.S. or abroad.

Charles Stark Draper Laboratory

Founded as MIT's Instrumentation Laboratory, Draper Laboratory became an independently operated, nonprofit research and educational organization in 1973. MIT and Draper Laboratory still collaborate in areas such as guidance, navigation, and control; computer and computational sciences; data and signal processing; material sciences; integrated circuitry; information systems; and underwater vehicle technologies.

Global Enterprise for Micro-Mechanics and Molecular Medicine (GEM4)

GEM4 bringstogether engineers and life scientists from around the world to apply the advances of engineering, science, and nanotechnology to global medical challenges.

Howard Hughes Medical Institute

Howard Hughes Medical Institute (HHMI) is a scientific and philanthropic organization that conducts biomedical research in collaboration with universities, academic medical centers, hospitals, and other research institutions throughout the country. Sixteen HHMI investigators hold MIT Faculty appointments.

Academic and Research Affiliations
(continued)

Idaho National Laboratory

Created in 2005 by the U.S. Department of Energy, the Idaho National Laboratory (INL) includes the visionary proposal for the National University Consortium (NUC) – five leading research universities from around the nation whose nuclear research and engineering expertise are of critical importance to the future of the nation's nuclear industry. MIT will initially lead the NUC team, whose goal is collaborative, coordinated nuclear research and education, accomplished in conjunction with the Center for Advanced Energy Studies (CAES). The NUC partners will establish the university-based Academic Centers of Excellence (ACE) to collaborate with CAES research programs and the collocated research centers of CAES. The NUC consists of MIT, Oregon State University, North Carolina State University, Ohio State University, and University of New Mexico.

Magellan Project

The Magellan Project is a five-university partnership to construct and operate two 6.5 meter optical telescopes at the Las Campanas Observatory in Chile. The telescopes allow researchers to observe planets orbiting stars in solar systems beyond our own and to explore the first galaxies that formed near the edge of the observable universe. Collaborating with MIT in the Magellan Project are the Carnegie Institute of Washington, Harvard University, the University of Arizona, and the University of Michigan.

Massachusetts Green High Performance Computing Center (MGHPCC)

In October, 2010 construction began in Holyoke, Mass., on a world-class, green, high performance computing center. The MGHPCC facility will provide state-of-the-art computational infrastructure in support of breakthroughs in science, thereby supporting the research missions of the participating institutions, strengthening partnerships with industry, and allowing Massachusetts to attract and retain the very best scientists to fuel the state's innovation economy. The participating institutions include MIT, the University of Massachusetts, Boston University, EMC, Cisco, and Accenture.

MIT-Portugal Program

MIT and the Portuguese Ministry of Science, Technology and Higher Education have announced plans to enter into a long-term collaboration to significantly expand research and education in engineering and management across many of Portugal's top universities. The wide-ranging initiative will be the broadest of its kind ever undertaken by the government of Portugal, and will include the participation of more than 40 MIT faculty from all five schools at the Institute. The MIT-Portugal Program will undertake research and education in several focus areas, and will give MIT an opportunity to gain insight into the planning, design, and implementation of transportation, energy, manufacturing, and bioengineering systems in Portugal.

MIT-Woods Hole Oceanographic Institution Joint Program in Oceanography and Applied Ocean Science and Engineering

MIT and the Woods Hole Oceanographic Institution jointly offer Doctor of Science and Doctor of Philosophy degrees in chemical oceanography, marine geology, marine geophysics, physical oceanography, applied ocean science and engineering, and biological oceanography. They also offer Master's and professional degrees in some disciplines.

Naval Construction and Engineering (Course 2N)

The graduate program in Naval Construction and Engineering at MIT is intended for active duty officers in the U.S. Navy, U.S. Coast Guard, and foreign navies that have been designated for specialization in the design, construction, and repair of naval ships. The curriculum prepares Navy, Coast Guard, and foreign officers for careers in ship design and construction, and is sponsored by Commander, Naval Sea Systems Command.

The Ragon Institute

The Ragon Institute, officially established in February 2009 and supported by the Phillip T. and Susan M. Ragon Foundation, seeks to establish a model of scientific collaboration that links the clinical, translational and basic science expertise at MGH, MIT, Harvard, and the Broad Institute to tackle the greatest global health challenges related to infectious disease research. See http://www.ragoninstitute.org/index.html

ROTC (Reserve Officer Training Corps) Programs

Military training has existed at MIT since students first arrived in 1865. In 1917, MIT established the nation's first Army ROTC unit. Today, MIT's Air Force, Army, and Navy ROTC programs also serve students from Harvard and Tufts Universities; the Air Force and Army programs also include Wellesley College students. These programs enable students to become commissioned military officers upon graduation and may provide scholarships. More than 12,000 officers have been commissioned from MIT, and more than 150 have achieved the rank of general or admiral.

Singapore-MIT Alliance

The Singapore-MIT Alliance (SMA) is an innovative engineering education and research collaboration of three premier academic institutions: MIT, National University of Singapore, and the Nanyang Technological University. SMA promotes global education and research in engineering and the life sciences through distance education. Offering graduate degrees in five engineering disciplines and one life science discipline, SMA is the largest interactive distance education collaboration in the world. More than 50 MIT faculty members and 50 from Singapore universities participate in SMA's programs.

Singapore-MIT Alliance for Research and Technology (SMART) Centre

Established in 2007, the SMART Centre is MIT's first research centre outside of Cambridge, MA and its largest international research endeavor. The Centre is also the first entity in the Campus for Research Excellence and Technological Enterprise (CREATE) currently being developed by Singapore's National Research Foundation.

The SMART Centre will: identify and carry out research on critical problems of societal significance and develop innovative solutions through its interdisciplinary research groups (IRGs); become a magnet for attracting and anchoring global research talent to Singapore; develop robust partnerships with local universities and institutions in Singapore; engage in graduate education by co-advising local doctoral students and post-doctoral associates; and help instill a culture of translational research, entrepreneurship and technology transfer through the SMART Innovation Centre.

Synthetic Biology Engineering Research Center

Five MIT researchers are among the pioneers behind a new research center in synthetic biology. The Synthetic Biology Engineering Research Center (SynBERC) was established in 2006, and is managed via the California Institute for Qualitative Biomedical Research. In addition to MIT, participating universities are the University of California at Berkeley, Harvard University, the University of California at San Francisco, and Prairie View A&M University. SynBERC's foundational research will be motivated by pressing biotechnology applications.

Wellesley-MIT Exchange Program

Through this cross-registration program, students may enroll in any courses at the other school, expanding the educational opportunities for participating students. Students also earn Massachusetts certificates to teach at the elementary and secondary level, through the Wellesley College Education Department.

Whitehead Institute for Biomedical Research

An independent basic research and teaching institution affiliated with MIT, the Whitehead Institute conducts research in developmental biology and the emerging field of molecular medicine. Faculty at the Whitehead Institute teach at MIT, and MIT graduate students conduct research and receive training in Whitehead Institute Laboratories.

Education Highlights

MIT has long maintained that professional competence is best fostered by coupling teaching with research and by focusing education on practical problems. This hands-on approach has made MIT a consistent leader in outside surveys of the nation's best colleges. MIT was the first university in the country to offer curriculums in architecture (1865), electrical engineering (1882), sanitary engineering (1889), naval architecture and marine engineering (1895), aeronautical engineering (1914), meteorology (1928), nuclear physics (1935), and artificial intelligence (1960s). More than 4,000 MIT graduates are professors at colleges and universities around the world. MIT faculty have written some of the best-selling textbooks of all time, such as *Economics* by Paul A. Samuelson and *Calculus and Analytic Geometry* by George Thomas. The following are some notable MIT teaching milestones since 1969, when humans, including MIT alumnus Buzz Aldrin, first landed on the moon.

1969 MIT launches the Undergraduate Research Opportunities Program (UROP), the first of its kind. The program, which enables undergraduates to work directly with faculty on professional research, subsequently is copied in universities throughout the world. About 2,800 MIT students participate in UROP annually.

1970 The Harvard-MIT Program in Health Sciences and Technology is established to focus advances in science and technology on human health and to train physicians with a strong base in engineering and science.

1971 MIT holds its first Independent Activities Period (IAP), a January program that emphasizes creativity and flexibility in teaching and learning. Almost 800 activities are offered annually, including design contests, laboratory projects, workshops, field trips, and courses in practical skills.

1977 MIT organizes the Program in Science, Technology, and Society to explore and teach courses on the social context and consequences of science and technology – one of the first programs of its kind in the U.S.

1981 MIT launches Project Athena, a $70 million program to explore the use of computers in education. Digital Equipment Corporation and IBM each contribute $25 million in computer equipment.

1981 The MIT Sloan School of Management launches its Management of Technology program, the world's first Master's program to focus on the strategic management of technology and innovation.

1983-1990 MIT language and computer science faculty join in the Athena Language Learning Project to develop interactive videos that immerse students in the language and character of other cultures. The work pioneers a new generation of language learning tools.

1984 MIT establishes the Media Laboratory, bringing together pioneering educational programs in computer music, film, graphics, holography, lasers, and other media technologies.

1991 MIT establishes the MacVicar Faculty Fellows Program, named in honor of the late Margaret A. MacVicar, to recognize outstanding contributions to teaching. MacVicar, a professor of physics, had conceived of, designed, and launched UROP (see 1969, above).

1992 MIT launches the Laboratory for Advanced Technology in the Humanities to extend its pioneering work in computer- and video-assisted language learning to other disciplines. Its first venture was a text and performance multi-media archive for studies of Shakespeare's plays.

1993 In recognition of the increasing importance of molecular and cell biology, MIT becomes the first college in the nation to add biology to its undergraduate requirement.

1995 MIT's Political Science Department establishes the Washington Summer Internship Program to provide undergraduates the opportunity to apply their scientific and technical training to public policy issues.

1998 MIT teams up with Singapore's two leading research universities to create a global model for long-distance engineering education and research. The first truly global collaboration in graduate engineering education and research, this large-scale experiment today is a model for distance education.

1999 The University of Cambridge and MIT establish the Cambridge-MIT Institute, whose programs include student and faculty exchanges, an integrated research program, professional practice education, and a national competitiveness network in Britain.

1999 MIT establishes the Society of Presidential Fellows to honor the most outstanding students worldwide entering the Institute's graduate programs. With gifts provided by lead donors, presidential fellows are awarded fellowships that fund first year tuition and living expenses.

2000 MIT Faculty approve the Communication Requirement (CR), which went into effect for the Class of 2005. The CR integrates substantial instruction and practice in writing and speaking into all four years and across all parts of MIT's undergraduate program. Students participate regularly in activities designed to develop both general and technical communication skills.

2001 Studio Physics is introduced to teach freshman physics. Incorporating a highly collaborative, hands-on environment that uses networked laptops and desktop experiments, the new curriculum lets students work directly with complicated and unfamiliar concepts as their professors introduce them.

2001 To provide a model for sharing of knowledge to benefit all humankind, MIT launches OpenCourseWare, a program that makes materials for nearly all of its courses freely available on the web.

2001 MIT establishes WebLab, a microelectronics teaching laboratory that allows students to interact remotely on the Web with transistors and other microelectronics devices anywhere and at any time.

2001 MIT's Earth System Initiative launches Terrascope, a freshman course where students work in teams to solve complex problems in earth sciences. Bringing together physics, mathematics, chemistry, biology, management, and communications, the course has enabled students to devise strategies for preserving tropical rainforests, understand the costs and the benefits of oil drilling in the Arctic National Wildlife Refuge, and plan a mission to Mars.

2002 To give engineering students the opportunity to develop the skills they'll need to be leaders in the workplace, MIT introduces the Undergraduate Practice Opportunities Program (UPOP). The program involves a corporate training workshop, job seminars taught by alumni, and a 10-week summer internship.

2003 MIT Libraries introduce DSpace, a digital repository that gathers, stores, and preserves the intellectual output of MIT's faculty and research staff, and makes it freely available to research institutions worldwide. Within a year of its launch, DSpace material had been downloaded more than 8,000 times, and more than 100 organizations had adopted the system for their own use.

2003 MIT's Computational and Systems Biology program (CSBi), an Institute-wide program linking biology, engineering, and computer science in a systems biology approach to the study of cell-to-cell signaling, tissue formation, and cancer, begins accepting students for a new Ph.D. program that will give them the tools for treating biological entities as complex living systems.

Education Highlights
(continued)

2005 Combining courses from engineering, mathematics, and management, MIT launches its Master's program in Computation for Design and Optimization, one of the first curriculums in the country to focus on the computational modeling and design of complex engineered systems. The program prepares engineers for the challenges of making systems ranging from computational biology to airline scheduling to telecommunications design and operations run with maximum effectiveness and efficiency.

2006 MIT creates the Campaign for Students, a fundraising effort dedicated to enhancing the educational experience at MIT through creating scholarships and fellowships, and supporting multidisciplinary education and student life.

2007 MIT makes material from virtually all MIT courses available online for free on OpenCourseWare (OCW). The publication marks the beginning of a worldwide movement toward open education that now involves more than 160 universities and 5,000 courses.

2009 MIT launches the Bernard M. Gordon-MIT Engineering Leadership Program. Through interaction with industry leaders, faculty, and fellow students, the program aims to help undergraduate engineering students develop the skills, tools and character they will need as future engineering leaders.

2009 MIT introduces a minor in Energy Studies, open to all undergraduates. The new minor, unlike most energy concentrations available at other institutions, and unlike any other concentration at MIT, is designed to be inherently cross-disciplinary, encompassing all of MIT's five schools. It can be combined with any major subject. The minor aims to allow the student to develop expertise and depth in their major discipline, but then complement that with the breadth of understanding offered by the energy minor.

2010 MIT introduces the flexible engineering degree for undergraduates. The degree, the first of its kind, allows students to complement a deep disciplinary core with an additional subject concentration. The additional concentrations can be broad and interdisciplinary in nature (energy, transportation, or the environment), or focused on areas that can be applied to multiple fields (robotics and controls, computational engineering, or engineering management).

2011 MIT announces MITx, an online learning initiative that will offer free open learning software. The institute expects the platform to enhance the educational experience of its on-campus students and serve as a host for a virtual community of millions of learners around the world. MIT plans to launch MITx in the spring of 2012.

Research Highlights

The following are selected research achievements of MIT faculty over the last four decades.

1969 Ioannis V. Yannas begins work on developing artificial skin – a material used successfully to treat burn victims.

1970 David Baltimore reports the discovery of reverse transcriptase, an enzyme that catalyzes the conversion of RNA to DNA. The advance, which led to a Nobel Prize for Baltimore in 1975, provided a new means for studying the structure and function of genes.

1973 Jerome Friedman and Henry Kendall, with Stanford colleague Richard Taylor, complete a series of experiments confirming the theory that protons and neutrons are made up of minute particles called quarks. The three received the 1990 Nobel Prize in Physics for their work.

1974 Samuel C.C. Ting, Ulrich Becker, and Min Chen discover the "J" particle. The discovery, which earned Ting the 1976 Nobel Prize in Physics, points to the existence of one of the six postulated types of quarks.

1975-1977 Barbara Liskov and her students design the CLU programming language, an object-oriented language that helped form the underpinnings for languages like Java and C++. As a result of this work and other accomplishments, Liskov later wins the Turing Award, considered the Nobel Prize in computing.

1975-1982 Joel Moses develops the first extensive computerized program (MACSYMA) able to manipulate algebraic quantities and perform symbolic integration and differentiation.

1976 Har Gobind Khorana and his research team complete chemical synthesis of the first human-manufactured gene fully functional in a living cell. The culmination of 12 years' work, it establishes the foundation for the biotechnology industry. Khorana won the 1968 Nobel Prize in Physiology/Medicine for other genetics work.

1977 Phillip Sharp discovers the split gene structure of higher organisms, changing the view of how genes arose during evolution. For this work, Sharp shared the 1993 Nobel Prize in Physiology/Medicine.

1977 Ronald Rivest, Adi Shamir, and Leonard Adleman invent the first workable public key cryptographic system. The new code, which is based on the use of very large prime numbers, allows secret communication between any pair of users. Still unbroken, the code is in widespread use today.

1979 Robert Weinberg reports isolating and identifying the first human oncogene – an altered gene that causes the uncontrolled cell growth that leads to cancer.

1981 Alan Guth publishes the first satisfactory model of the universe's development in the first 10-32 seconds after the Big Bang.

1982 Alan Davison discovers a new class of technetium compounds that leads to the development of the first diagnostic technetium drug for imaging the human heart.

1985 Susumu Tonegawa describes the structure of the gene for the receptors – "anchor molecules" – on the white blood cells called T lymphocytes, the immune system's master cells. In 1987, Tonegawa receives the Nobel Prize in Physiology/Medicine for similar work on the immune system's B cells.

Research Highlights
(continued)

1986 H. Robert Horvitz identifies the first two genes found to be responsible for the process of cell death, which is critical both for normal body development and for protection against autoimmune diseases, cancer, and other disorders. Going on to make many more pioneering discoveries about the genetics of cell death, Horvitz shares the 2002 Nobel Prize in Physiology/Medicine for his work.

1988 Sallie Chisholm and associates report the discovery of a form of ocean plankton that may be the most abundant single species on earth.

1990 Julius Rebek, Jr. and associates create the first self-replicating synthetic molecule.

1990 Building on the discovery of the metathesis – the process of cutting carbon-carbon double bonds in half and constructing new ones – Richard Schrock devises a catalyst that greatly speeds up the reaction, consumes less energy, and produces less waste. A process based on his discovery is now in widespread use for efficient and more environmentally friendly production of important pharmaceuticals, fuels, synthetic fibers, and many other products. Schrock shares the 2005 Nobel Prize in Chemistry for his breakthrough.

1991 Cleveland heart doctors begin clinical trials of a laser catheter system for microsurgery on the arteries that is largely the work of Michael Feld and his MIT associates.

1993 H. Robert Horvitz, together with scientists at Massachusetts General Hospital, discover an association between a gene mutation and the inherited form of amyotrophic lateral sclerosis (Lou Gehrig's disease).

1993 David Housman joins colleagues at other institutions in announcing a successful end to the long search for the genetic defect linked with Huntington's disease.

1993 Alexander Rich and post-doctoral fellow Shuguang Zhang report the discovery of a small protein fragment that spontaneously forms into membranes. This research will lead to advances in drug development, biomedical research, and the understanding of Alzheimer's and other diseases.

1994 MIT engineers develop a robot that can "learn" exercises from a physical therapist, guide a patient through them, and – for the first time – record biomedical data on the patient's condition and progress.

1995 Scientists at the Whitehead Institute for Biomedical Research and MIT create a map of the human genome and begin the final phase of the Human Genome Project. This powerful map contains more than 15,000 distinct markers and covers virtually all of the human genome.

1996 A group of scientists at MIT's Center for Learning and Memory, headed by Matthew Wilson and Nobel laureate Susumu Tonegawa, demonstrate with new genetic and multiple-cell monitoring technologies how animals form memory about new environments.

1997 MIT physicists create the first atom laser, a device which is analogous to an optical laser but emits atoms instead of light. The resulting beam can be focused to a pinpoint or made to travel long distances with minimal spreading.

1998 MIT biologists led by Leonard Guarente identify a mechanism of aging in yeast cells that suggests researchers may one day be able to intervene in, and possibly inhibit, the aging process in certain human cells.

1998 An interdisciplinary team of MIT researchers, led by Yoel Fink and Edwin L. Thomas, invent the "perfect mirror," which offers radical new ways of directing and manipulating light. Potential applications range from a flexible light guide that can illuminate specific internal organs during surgery to new devices for optical communications.

1999 Michael Cima, Robert Langer, and graduate student John Santini report the first microchip that can store and release chemicals on demand. Among its potential applications is a "pharmacy" that could be swallowed or implanted under the skin and programmed to deliver precise drug dosages at specific times.

1999 Alexander Rich leads a team of researchers in the discovery that left-handed DNA (also known as Z-DNA) is critical for the creation of important brain chemicals. Having first produced Z-DNA synthetically in 1979, Rich succeeded in identifying it in nature in 1981. He also discovered its first biological role and received the National Medal of Science for this pioneering work in 1995.

2000 Scientists at the Whitehead/MIT Center for Genome Research and their collaborators announce the completion of the Human Genome Project. Providing about a third of all the sequences assembled, the Center was the single largest contributor to this international enterprise.

2000 Researchers develop a device that uses ultrasound to extract a number of important molecules noninvasively and painlessly through the skin. They expect that the first application will be a portable device for noninvasive glucose monitoring for diabetics.

2000 Researchers from the MIT Sloan School of Management launch the Social and Economic Explorations of Information Technology (SeeIT) Project, the first empirical study of the effects of Information Technology (IT) on organizational and work practices. Examining IT's relationship to changes in these models, SeeIT is providing practical data for understanding and evaluating IT's business and economic effects, which will enable us taking full advantage of its opportunities and better control its risks.

2001 In a step toward creating energy from sunlight as plants do, Daniel Nocera and a team of researchers invent a compound that, with the help of a catalyst and energy from light, produces hydrogen.

2002 MIT researchers create the first acrobatic robotic bird – a small, highly agile helicopter for military use in mountain and urban combat.

2002-2005 Scientists at MIT, the Whitehead Institute for Biomedical Research, and the Broad Institute complete the genomes of the mouse, the dog, and four strains of phytoplankton, photosynthetic organisms that are critical for the regulation of atmospheric carbon dioxide. They also identify the genes required to create a zebrafish embryo. In collaboration with scientists from other institutions, they map the genomes of chimpanzees, humans' closest genetic relative, and the smallest known vertebrate, the puffer fish.

2003 MIT scientists cool a sodium gas to the lowest temperature ever recorded – a half-a-billionth of a degree above absolute zero. Studying these ultra-low temperature gases will provide valuable insights into the basic physics of matter; and by facilitating the development of better atomic clocks and sensors for gravity and rotation, they also could lead to vast improvements in precision measurements.

Research Highlights
(continued)

2004 MIT's Levitated Dipole Experiment (LDX), a collaboration among scientists at MIT and Columbia, generates a strong dipole magnetic field that enables them to experiment with plasma fusion, the source of energy that powers the sun and stars, with the goal of producing it on Earth. Because the hydrogen that fuels plasma fusion is practically limitless and the energy it produces is clean and doesn't contribute to global warming, fusion power will be of enormous benefit to humankind and to earth systems in general.

2004 A team led by neuroscientist Mark Bear illuminates the molecular mechanisms underlying Fragile X Syndrome, and shows that it might be possible to develop drugs that treat the symptoms of this leading known inherited cause of mental retardation, whose effects range from mild learning disabilities to severe autism.

2004 Shuguang Zhang of MIT's Center for Biomedical Engineering, Marc A. Baldo, assistant professor of electric engineering and computer science, and recent graduate Patrick Kiley, first figure out how to stabilize spinach proteins – which, like all plants, produce energy when exposed to light – so they can survive without water and salt. Then, they devise a way to attach them to a piece of glass coated with a thin layer of gold. The resulting spinach-based solar cell, the world's first solid-state photosynthetic solar cell, has the potential to power laptops and cell phones with sunlight.

2005 MIT physicists, led by Nobel laureate Wolfgang Ketterle, create a new type of matter, a gas of atoms that shows high-temperature superfluidity.

2005 Vladimir Bulovic, professor of electrical engineering and computer science, and Tim Swager, professor of chemistry, develop lasing sensors based on a semiconducting polymer that is able to detect the presence of TNT vapor subparts per billion concentrations.

2006 MIT launches the MIT Energy Initiative (MITei) to address world energy problems. Led by Ernest J. Moniz and Robert C. Armstrong, MITei coordinates energy research, education, campus energy management, and outreach activities across the Institute.

2007 Rudolf Jaenisch, of the Whitehead Institute for Biomedical Research, conducts the first proof-of-principle experiment of the therapeutic potential of induced pluripotent stem cells (iPS cells), using iPS cells reprogrammed from mouse skin cells to cure a mouse model of human sickle-cell anemia. Jaenisch would then use a similar approach to treat a model of Parkinson's disease in rats.

2007 Marin Soljacic and his colleagues develop a new form of wireless power transmission they call WITricity. It is based on a strongly coupled magnetic resonance and can be used to transfer power over distances of a few meters with high efficiency. The technique could be used commercially to wirelessly power laptops, cell phones, and other devices.

2007 David H. Koch '62, SM '63 gives MIT $100 million to create the David H. Koch Institute for Integrative Cancer Research. The Institute, scheduled to open in 2010, will bring together molecular geneticists, cell biologists, and engineers in a unique multidisciplinary approach toward cancer research.

2007 Tim Jamison, Professor of Chemistry, discovers that cascades of epoxide-opening reactions that were long thought to be impossible can very rapidly assemble the Red Tide marine toxins when they are induced by water. Such processes may be emulating how these toxins are made in nature and may lead to a better understanding of what causes devastating Red Tide phenomena. These methods also open up an environmentally green synthesis of new classes of complex highly biologically active compounds.

2007 MIT mathematicians form part of a group of 18 mathematicians from the U.S. and Europe that maps one of the the most complicated structures ever studied: the exceptional Lie group E8. The “answer” to the calculation, if written, would cover an area the size of Manhattan. The resulting atlas has applications in the fields of string theory and geometry.

2008 Mriganka Sur’s laboratory discovers that astrocytes, star-shaped cells in the brain that are as numerous as neurons, form the basis for functioning brain imaging. Using ultra high-resolution imaging in the intact brain, they demonstrate that astrocytes regulate blood flow to active brain regions by linking neurons to brain capillaries.

2008 A team led by Marc A. Baldo designs a solar concentrator that focuses light at the edges of a solar power cell. The technology can increase the efficiency of solar panels by up to 50 percent, substantially reducing the cost of generating solar electricity.

2008 Daniel Nocera creates a chemical catalyst that hurdles one of the obstacles to widespread use of solar power — the difficulty of storing energy from the sun. The catalyst, which is cheap and easy to make, uses the energy from sunlight to separate the hydrogen and oxygen molecules in water. The hydrogen can then be burned, or used to power an electric fuel cell.

2009 A team of MIT researchers led by Angela Belcher reports that it was able to genetically engineer viruses to produce both the positively and negatively charged ends of a lithium ion battery. The battery has the same energy capacity as those being considered for use in hybrid cars, but is produced using a cheaper, less environmentally hazardous process. MIT President Susan Hockfield presents a prototype battery to President Barack Obama at a press briefing at the White House.

2009 Researchers at MIT’s Picower Institute for Learning and Memory show for the first time that multiple, interacting genetic risk factors may influence the severity of autism symptoms. The finding could lead to therapies and diagnostic tools that target the interacting genes.

2009 Professor Gerbrand Ceder and graduate student Byoungwoo Kang develop a new way to manufacture the material used in lithium ion batteries that allows ultrafast charging and discharging. The new method creates a surface structure that allows lithium ions to move rapidly around the outside of the battery. Batteries built using the new method could take seconds, rather than the now standard hours, to charge.

2009 As neuroscience progresses rapidly toward an understanding of basic mechanisms of neural and synapse function, MIT neuroscientists are discovering the mechanisms underlying brain disorders and diseases. Li-Huei Tsai’s laboratory describes mechanisms that underlie Alzheimer’s disease, and propose that inhibition of histone deacetylases is therapeutic for degenerative discorders of learning and memory. Her laboratory also discovers the mechanisms of action of the gene Disrupted-in-Schizophrenia 1 (DISC1), and demonstrates why drugs such as lithium are effective in certain instances of schizophrenia. This research opens up pathways to discovering novel classes of drugs for devastating neuropsychiatric conditions.