Massachusetts Institute of Technology

Institutional Self-Study

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Overview

The Massachusetts Institute of Technology (MIT) has honored its distinctive mission since coming to life, in 1861, as a "School of Industrial Science." As America assumed the confidence and complications of an industrialized society, MIT offered students an education of particular relevance and purpose. Founded on a commitment to tackling real-world problems, a passionate belief in learning-by-doing, and the then-revolutionary notion that teaching and research should be deliberately linked, within decades MIT was producing innovators and innovations that would, in several senses, take us to the moon.

Today, with a deep commitment to public service and a boundless curiosity about the physical universe and human society, the Institute has a strikingly global community of faculty, researchers, students and alumni that collectively drive our engine of innovation and discovery. In an era increasingly defined by the products and implications of science and technology, and building on the Institute's founding ideals and long record of service, we strive to advance the outer limits of knowledge in many fields and develop practical answers to humanity's shared problems.

MIT's core ideals find a physical manifestation in the most recognizable part of our campus: our "main group" of buildings and great dome. The frieze of these buildings include a carved band of names, giants of science and philosophy, mathematics and medicine, architecture, art and engineering: Aristotle and Archimedes, Newton and Franklin, Darwin and Pasteur. While the world has changed greatly since these names were carved almost a century ago, MIT's commitment to the daring spirit of these individuals remains undiminished. The Institute actively recruits individuals who embody the values and characteristics of the names on the frieze – students and faculty who are passionate about math and science, engineering and design, art and philosophy. Hopeful, ambitious and curious, they each seek to make their own contribution to the building blocks of human understanding.

Despite the endurance of our mission and passion of our faculty and students, many aspects of the Institute look considerably different even from a few decades ago. In 1960, 99 percent of MIT's undergraduates were white and 97 percent were men; now, half of MIT's undergraduates are nonwhite, and almost half are women. Our community is also more international in composition, global in outlook, and increasingly multidisciplinary in its intellectual interests. Reflecting the changing needs of the Institute since our last NEASC accreditation visit in 1999, we have completed a comprehensive review of the undergraduate curriculum and begun implementing some exciting changes. We have also built and/or renovated three million gross square feet of space, and initiated a long-range planning process to define future needs of MIT's physical plant. The Institute completed a $2 billion capital campaign, the largest in MIT's history, and launched an additional fundraising initiative for priorities related to student life and learning.

The pages that follow chronicle advances such as those above, but also point to areas where we must devote sustained attention in the years ahead. Although our challenges are common to many institutions of higher education, each one has dimensions unique to MIT. Our hope is to engage the visiting team with the following topics, among others, in a substantive way during its visit in October 2009.

- ***Preparing MIT undergraduates for a lifetime of learning***
  While the past fifty years of undergraduate education at MIT have been successful in producing outstanding graduates, developments in the world and changing characteristics of students have brought important tensions to the curriculum. The most exciting challenges in science and technology require us to reassess whether the content of our scientific education is flexible enough to meet those demands. Because it is impossible to provide completely satisfactory

professional preparation in four years, our most important task is to construct an educational infrastructure that prepares MIT graduates for a lifetime of learning. We also recognize that students will need more than a world-class technical education to succeed. For all these reasons, we have spent over a decade rethinking the classroom and laboratory experiences, enriching our extracurricular offerings, and bringing them together to create a richer and better calibrated mix. Achieving an ideally integrated triad of academics, research, and community remains a critical goal of the Institute, and a major theme of this report.

- ***Leveraging our strong tradition of collaborative interdisciplinary research***
  Traditional boundaries among scientific disciplines have receded in recent years, a fact particularly true at the interface of life sciences with the physical sciences and engineering. In the last half-century, life science has swiftly evolved into a quantitative experimental discipline that delivers critically important applications, from medical treatments that are saving lives, to environmental strategies that will help save the planet. Engineering and computational breakthroughs have propelled huge progress in the life sciences, and the life sciences now supply intriguing new tools for engineers. MIT's tradition of cross-department centers, uniform strength among academic disciplines, and unified governance structure positions us to take advantage of this new scientific era. In response, the Institute has launched a number of key initiatives, such as those in energy and integrative cancer research, but continues to face many strategic questions. What will the most important areas of scholarship look like in 20 years? How do we best bring MIT's core strength in engineering to bear on the world's present and future challenges? What partners will we need for success? To help answer these questions and guide our tradition of cross-disciplinary work into the future, MIT has entered a period of expanded strategic imagination and, as a result, greater levels of collaborative planning.

- ***Refining our understanding of MIT's global engagement***
  Like many institutions of higher learning, MIT is grappling with an appropriate strategy for global engagement in education and research. For many years, the Institute's participation in solving problems of international importance has been well recognized, but preparing undergraduates for global roles as future leaders in their disciplines and as citizens of the world has not been a high Institute priority. In today's interconnected society, it is imperative that all MIT graduates be able to adapt to different cultures and understand the larger context in which their future lives and careers will unfold. This is particularly true given that many of the greatest technological and scientific challenges facing current and future generations are global in nature: climate change, energy, poverty, health care, clean water, and the quality of our ocean ecosystems. These changes have profound implications for how our faculty conducts research and for the kinds of educational opportunities we must provide for students. MIT is deeply invested in exploring the best global education for undergraduates and defining an international engagement strategy for faculty and student research.

- ***Strengthening MIT's diversity and culture of inclusion***
  For our students to contribute to future research areas and lead in global communities, we must prepare them to step outside their own worldviews, to appreciate other people's life experiences and to engage their perspectives. For the same reasons, a diverse community of faculty and staff is crucial to MIT's future success. This report particularly emphasizes our extensive efforts to recruit and retain women and underrepresented minorities all along the academic pipeline. However, a community succeeds in its diversity only when it looks beyond the numbers alone and focuses on creating an environment in which all of its members can do their very best work. Therefore the report also reflects on our reenergized effort to create a culture of inclusion, so MIT

can actively capitalize on our community's diverse skills and perspectives, and better advance the fundamental mission of MIT.

Threading throughout the report is the recognition that these high aspirations are made all the more daunting by the global economic crisis. Around the world and in every sector, fundamental economic assumptions have dramatically changed over the last year. Last November, anticipating a dramatic decline in our endowment's value, we set out a plan to significantly reduce our General Institute Budget by $100 to $150 million within two to three years. Given the magnitude of these reductions, MIT has been working to design lasting, sustainable changes to best align resources to our mission. Since February 2009, a group of almost 200 faculty, students and staff has been looking beyond the scope of any individual unit, department, or school to design broad, creative strategies to cut expenses and share resources while sustaining MIT's standards of excellence. We expect a preliminary set of their recommendations to be released as our accreditation report is finalized. The recommendations will be included as an appendix and discussed as part of the evaluation team visit in October 2009.

As we inevitably curtail functions and habits that do not accelerate our progress, it is clear that MIT will not look the same at the time of our next NEASC evaluation visit in 2019. Although these changes will require sacrifices, we are optimistic that the Institute will emerge stronger, more flexible and better equipped to generate the knowledge and innovations, and the scholars and innovators, the nation and world need now more than ever.

Process and Participants

In Fall 2007, MIT's Self-Study Steering Committee commenced planning for our decennial accreditation visit. It began by reviewing the standards of accreditation for the New England Association of Schools and College's (NEASC), and the recommendation report from the Institute's last evaluation visit in 1999. In addition to focusing on areas of progress over the last decade, the Steering Committee suggested several key topics for reflection in the 2009 report, including: the work of MIT's strategic task forces; our continuing emphasis on issues of curricular renewal, diversity, globalization, and interdisciplinary research; and the historic aspects of MIT that foster our culture of creativity, collaboration, and innovation. These topics were presented to members of the Academic Council, MIT's senior academic and administrative leaders, at their January 2008 retreat. To draft the report, the Steering Committee assigned a coordination team to work with MIT committees, departments, and units across the Institute. Beginning in Spring 2007, the coordinators met monthly for a year and a half to collect and synthesize information.

In Fall 2008, the coordinators presented chapter outlines and major emerging themes to the Steering Committee in a series of executive briefings. Guided by feedback from the briefings, chapters were drafted and vetted by faculty, students, and administrators throughout the 2008-09 academic year. Additionally, members of the coordination team provided informational briefings on accreditation at MIT's Faculty Policy Committee, the Committee on the Undergraduate Program, the Committee on the Graduate Program, an Institute-wide Faculty Meeting, and at sessions with undergraduate and graduate student leaders. A draft report was made available for community comment in summer 2009, and third-party comment was solicited via the MIT website.

As part of the accreditation process, NEASC has requested that institutions become increasingly explicit in the areas of student achievement and success. To this end, MIT was asked to complete data forms demonstrating our explicit assessment efforts (E Series) and our measures of student success (S Series). Given our routine use of comparative data and desire to highlight MIT's Visiting Committee structure, we ascertained that the standard templates were an imperfect fit for our institution. At the encouragement of NEASC, we proposed – and were approved to use – an alternative set of data forms. The Office of Institutional Research analyzed extensive survey data and consulted with academic department heads to prepare the required documents. The results of our analysis are integrated into relevant chapters, and the completed data schedules are provided as a separate appendix.

Steering Committee
Susan Hockfield, *President*
Phillip L. Clay, *Chancellor*
Michael J. Faber, *Advisor, Office of the President (Self-Study Coordinator)*
Kirk D. Kolenbrander, *Vice President for Institute Affairs and Secretary of the Corporation*
Steven R. Lerman, *Vice Chancellor and Dean for Graduate Education*
L. Rafael Reif, *Provost*
Theresa M. Stone, *Executive Vice President and Treasurer*

Coordination Team
William H. Colehower, *Senior Planner, Facilities*
Elizabeth D. Cooper, *Senior Project Manager, Office of Faculty Support*
Pamela P. Delphenich, *Director of Campus Planning and Design*
Michael J. Faber, *Advisor, Office of the President*

Process and Participants

Robert V. Ferrara, *Executive Director of Strategic Planning, Communications and Alumni Relations, Office of the Dean for Student Life*
Steven Gass, *Associate Director for Public Services, MIT Libraries*
Barrie Gleason, *Director of Communication, Office of the Dean for Graduate Education*
Jerrold M. Grochow, *Vice President for Information Services and Technology*
Stuart Kiang, *Director of Reference Publications Office*
Kirk D. Kolenbrander, *Vice President for Institute Affairs and Secretary of the Corporation*
Lorenna Lee-Houghton, *Graduate Student Representative*
Deborah A. Leitch, *Senior Director, Special Projects, Office of the Executive Vice President and Treasurer*
Douglas W. Pfeiffer, *Assistant Provost for Administration*
Elizabeth Reed, *Senior Associate Dean, Office of the Dean for Undergraduate Education*
David Segaloff, *Special Assistant to the Vice President for Information Systems and Technology*
Ballin Smith, *Undergraduate Student Representative*
Lydia Snover, *Director of Institutional Research*
Sharon E. Westerfeld, *Assistant Director, Office of the Dean for Student Life*
Ann J. Wolpert, *Director of Libraries*
Nancy Y. J. Wong, *Research Analyst, Office of the Provost*

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Robin Baughman
Debbie H. Berechman
Robert G. Boes
Alisa K. Braithwaite
Lori Breslow
Vladamir Bulovic
Richard Caballero
Mary Callahan
Claude R. Canizares
Christopher Capozzola
Stephen E. Carson
Anantha P. Chandrakasan
Robbin N. Chapman
Amy E. Clark
Costantino Colombo
Peter Cummings
Francine J. Crystal
Wilson D'Souza
Thomas DeFrantz
Michel Anne-Frederic DeGraff
Margaret K. Delano
John C. Desforge
Louis DiBerardinis
John DiFava
Thayer Donham
John J. Donnelly
Martin Dugal
Veronica R. DuLong
Pamela Dumas Serfes
Sara F. Ellison
Gillian C. Emmons
Mary Z. Enterline
Laurie A. Everett
Genevre Filiault
Deborah L. Fisher
Christine Fitzgerald
Anna Frazer
Elaine C. Fulton
Tiffany W. Guo
Joseph F. Gifun
Amy K. Glasmeier
Suzanne L. Glassburn
Patrick Hale
Gregory A. Harris
Wesley L. Harris
Daniel E. Hastings
John B. Hawes, Jr.
Malgorzata Hedderick
Diana Henderson
Walter E. Henry
Erica C. James
Christopher M. Jones
Edmund A. Jones
Stephanie Keeler
David Kennedy
Philip S. Khoury
Leila W. Kinney
Melanie Kenderdine
Vijay M. S. Kumar
Thomas A. Kochan
Steven M. Lanou
Julia Ledewitz
Helen Elaine Lee
Monica O. Lee
Steven R. Lerman
Sonia Liou
Barbara H. Liskov
Susann Duff LuperFoy
Kathleen L. MacArthur
Allen M. Marcum
Barbara A. Masi
Matthew L. McGann
Timothy J. McGovern
Kathleen MacArthur
Jennifer L. Marshall
Ryan Miller
Rebecca M. Millson
Carrie S Moore
R. Gregory Morgan

Process and Participants

Doreen Morris
Simon A. Nasser
Jeffrey L. Newton
Nathaniel W. Nickerson
Karen A. Nilsson
Julie B. Norman
O'Neil A. S. Outar
Michael Kobina Owu
Tomas Palacios
Pardis Parsa
Jagruti S. Patel
Margaret L. Peterson
Preeya S. Phadnis
Charlene M. Placido
Jason M. Pontin
Tracy F. Purinton
David W. Randall
Robert M. Randolph
Janet Rankin
Theresa M. Regan
Audrey E. Resutek
Gail Rock
Ruthy K. Rosenberg
Israel Ruiz
Jocelyn S. Sales
Richard J. Samuels
Bishwapriya Sanyal
Martin A. Schmidt
Stuart Schmill
Camilla Shannon
Anthony P. Sharon
Lianne P. Shields
Lisa O'Leary Shuler
Alan E. Siegel
Mandy D. Smith Ryan
Robert W. Smyser
Paul Spangle
Sally Susnowitz
Andrea R. Sutton
David M. Templeton
Oliver Thomas
Rashmi Tiwari
James Torres
Daniel Trujillo
Hsin-Yu Sidney Tsai
J. Kim Vandiver
Joel Voldman
Tara E. Walor
Jed Wartman
Shirley Wong
Shawna L. Young
Dick K. P. Yue
Victor Zue

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The mission of MIT is to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century.

The Institute is committed to generating, disseminating, and preserving knowledge, and to working with others to bring this knowledge to bear on the world's great challenges. MIT is dedicated to providing its students with an education that combines rigorous academic study and the excitement of discovery with the support and intellectual stimulation of a diverse campus community. We seek to develop in each member of the MIT community the ability and passion to work wisely, creatively, and effectively for the betterment of humankind.

— MIT mission statement

The Massachusetts Institute of Technology admitted its first students in 1865, four years after the approval of its founding charter. The opening of the Institute capped an extended effort by William Barton Rogers, a distinguished natural scientist, to establish a new kind of independent educational institution relevant to an increasingly industrialized America. Rogers stressed the pragmatic and the practical. He believed that professional competence is best fostered by coupling teaching and research and by focusing attention on real-world problems. This synthesis of the intellectual and the practical epitomizes MIT's educational philosophy and is succinctly captured in our motto, *mens et manus*—mind and hand.

Beyond the merely practical, Rogers espoused a sense of moral responsibility and dedication to service. Recognizing that technological innovation had yielded powerful new weapons, Rogers advocated for MIT alumni to "take the lead in helping society guide technology toward its more beneficial applications. … Consequently, a profound ethical imperative has been deeply imbedded in the identity of the Institute from its founding."[1] Additionally, Rogers believed in the importance of providing a balanced education that would combine professional preparation with a liberal education.

MIT has reexamined its mission several times to ensure its continued resonance with the needs of the Institute community. The first reassessment came in 1949 with the *Report of the Committee on Educational Survey*, commonly known as the Lewis Committee Report.[2] The report reaffirmed the principles set forth by William Barton Rogers and added several others: the value of education as preparation for life; a focus on fundamentals; the belief that MIT should pursue excellence within a specialized domain; and the importance of a unified Institute-wide faculty. Perhaps most important, the Lewis Committee Report recognized that MIT must provide an "education for life." It recommended expanding beyond the confines of science and engineering and creating our present-day School of Humanities, Arts, and Social Sciences.

MIT's next major assessment of its mission and purposes coincided with its 10-year accreditation in 1998. The work of the Task Force on Student Life and Learning helped further refine and articulate the Institute's guiding principles.[3] These principles include an integrated triad of academics, research, and community; the shared passion among students and faculty for intensity, curiosity, and excitement; and the importance of intellectual and personal diversity among members of the MIT community. The work of the Task Force on

[1] MIT, *Report of the Task Force on the Undergraduate Educational Commons* (October 2006), p. 12. The report is available in the accreditation team room and at http://web.mit.edu/committees/edcommons/documents/task_force_report.html.

[2] The report, published in December 1949, is available in the accreditation team room and at http://libraries.mit.edu/archives/mithistory/pdf/lewis.pdf.

[3] The *Report of the Task Force on Student Life and Learning* (September 1998) is available in the accreditation team room and at http://web.mit.edu/committees/sll/tf.html.

Student Life and Learning provided the foundation for our current mission statement, which appears at the beginning of this chapter and was approved by the Executive Committee of the Corporation, our governing board, in September 1999.

Beginning in 2003, MIT revisited its mission once again, through the Task Force on the Undergraduate Educational Commons. Given that the relevance of science in everyday life has increased, the Task Force reexamined the Institute's guiding principles within the context of modern society. It concluded that "an MIT education is one grounded in science and technology that ignites a passion for learning, provides the intellectual and personal foundations for future development, and illuminates the breadth, depth, and diversity of human knowledge and experience, in order to enable each student to develop a coherent intellectual identity. Collectively, such students can lead the world in developing technologies creatively and using their talents to improve the state of the natural world and humankind."[4] These findings reinforce our mission statement and demonstrate that MIT's founding principles remain fully intact as we approach our 150th birthday.

Projections

The Institute's mission animates our research—research that leads to breakthroughs such as implantable wafers that have revolutionized cancer treatment, or the daring, real-world analyses and prescriptions of our Jameel Poverty Action Lab. Our mission is the spirit behind the Laboratory for Sustainable Business at MIT Sloan, and it drives all the Institute's efforts to design and engineer realistic, affordable green cities around the world. Perhaps nothing better exemplifies the commitment to our mission than the interest of the MIT community in finding solutions to the seemingly intractable problem of world energy. More than 70 subjects offered across all five MIT schools have a substantive connection to energy issues, and in the fall of 2009, we will launch a new minor in energy. In recent years, student interest in energy has expanded dramatically, spawning a rich array of student-driven projects, groups, and coordinated activities. The student-founded and student-led MIT Energy Club now has over 1,500 members and hosts what has been called the most high-profile energy conference in the country.

These are just a few examples of how the Institute's emphasis on academics, research, and community serves our goal of finding practical solutions to the world's most challenging problems. Our curriculum and vision for student life and learning are profoundly influenced by our guiding principles, including the centrality of science and technology, the need for practical hands-on learning, the excitement of discovery, a tradition of service to the nation and the world, and the importance of a diverse community. All of these ideas are central themes in the report that follows, for MIT's mission defines our distinctive character and reflects both our traditions and our vision for the future.

[4] MIT, *Report of the Task Force on the Undergraduate Educational Commons* (October 2006), p. 19.

I. DEPARTMENT-BASED PLANNING AND EVALUATION
Planning and resource allocation
Visiting committees
II. KEY AREAS OF INSTITUTE-WIDE PLANNING AND EVALUATION
Curricular renewal
Interdisciplinary research
Global engagement
III. SUPPORT FOR EVALUATION EFFORTS
IV. PROJECTIONS

MIT integrates multiple layers of planning and evaluation activity into its governance model and performs them at the department, school, and Institute levels. These efforts are continuous rather than periodic. In addition to an annual assessment of resource needs, each department undergoes a biannual evaluation by a visiting committee of our governing body that examines the academic program and issues of student learning. At the same time, many cross-department committees, councils, and groups are charged with evaluating policies and programs throughout MIT. In recent years, MIT has increasingly focused on fully integrating its financial and academic planning efforts, and coordinating them with Institute-wide initiatives.

This ongoing planning involves bold, innovative thinking and takes place in both good times and challenging ones. Through continual efforts to assess programs, strengthen operations, and coordinate financial and academic planning, the Institute has been able to approach the current global financial crisis from a position of relative strength. Although no one can fully predict how the economy will affect MIT and higher education in the months and years ahead, the Institute is taking steps to reduce spending, while protecting and fostering the creative, dynamic, and stimulating environment that defines us. To this end, MIT has launched an Institute-wide Planning Task Force to assess how best to develop strategies and practices to align the Institute's human and financial resources with its mission.

This chapter examines planning and evaluation efforts at the department level, highlights initiatives that draw from work across the Institute, and describes the data-driven nature of MIT's evaluation processes. It concludes with MIT's response to new fiscal constraints and our efforts to make the Institute stronger, more efficient, and more effective.

I. DEPARTMENT-BASED PLANNING AND EVALUATION

Planning and resource allocation

MIT is organized into departments, sections, and programs, which are housed within its five schools: Architecture and Planning; Engineering; Humanities, Arts, and Social Sciences; MIT Sloan; and Science.[5] MIT's core academic-planning exercise requires each academic department to define short- to

[5] Alongside the five schools, the Division of Health Sciences and Technology (HST) is a unique cross-disciplinary joint venture with Harvard University. Over 400 graduate students of science, medicine, engineering, and management take their training side by side at HST (http://hst.mit.edu).

medium-term resource needs by producing an annual budget document. The information contained in these department documents is usually data-driven and reflects the priorities of faculty constituents who represent each of MIT's academic disciplines. These documents are reviewed and prioritized by each academic dean and then combined into a comprehensive, prioritized school budget plan. This plan, in turn, is submitted to the provost, who determines annual academic budget allocations based on school and Institute priorities and available resources. (Institute-wide resource allocations are determined in the context of the financial framework, outlined in Chapter 9, "Financial Resources.") In addition to this budgeting process, departments make critical evaluations of their achievements on an annual basis; these assessments are communicated to the provost via the school deans.

As one of its guiding principles, the Institute is committed to supporting those academic departments, research laboratories, and centers having the greatest intellectual promise, and those administrative areas whose operational effectiveness can benefit most from Institute resources. Thanks to historically strong programs coupled with ongoing relationships with alumni, industry, and other external donors, many of the academic and research units have developed extensive financial resources, both endowed and expendable. These resources often supplement general Institute funds, giving units a diversified funding base. The ability to raise outside resources, including sponsored-research funds directed to specific projects as well as less-restricted philanthropic gifts, can serve as an indicator of the success of a particular activity. Activities identified as successful may merit additional Institute financial support and/or allocations of space. In this way, individual units work in partnership with the central administration to place the most promising activities at the center of the Institute's long-term planning strategies.

For the most part, MIT's Lincoln Laboratory planning process proceeds independently from campus-based planning efforts. Largely funded by the Department of Defense, Lincoln Laboratory is subject to rigorous budget- and personnel-planning requirements that form the basis for regular program reviews. The government oversight committee that controls the funding for the Laboratory's research and development programs conducts the program reviews. The MIT associate provost and vice president for research has responsibility for general oversight of Lincoln Laboratory and participates in regular meetings of the lab's Steering Committee and in an annual planning retreat. In addition, a Lincoln Laboratory Advisory Board—appointed by the provost and consisting of outside representatives from industry and academia, former military personnel, and MIT faculty—meets semiannually to review and provide advice on strategic plans and directions.

Visiting committees

Since their establishment in 1875, visiting committees have influenced the course of education and research at MIT. Operating as advisory groups to the Institute's governing board, the MIT Corporation, the committees provide appraisal, advice, and insight about each academic department and other activities of the Institute. Members help to maintain a close relationship between academic procedure and professional practice, while providing expert commentary on current and proposed departmental programs. Through interviews with the visiting committees, faculty and students participate in this facet of Institute governance. The visiting committees provide regular, substantive and highly valued program reviews.

Approximately 400 distinguished scientists, engineers, scholars, entrepreneurs, executives, and educators serve on the Institute's 30 visiting committees. Each committee is approved by the Corporation and typically includes five Corporation members appointed by the chairman of the Corporation, one of whom chairs the committee; six alumni/ae nominated by the Association of Alumni and Alumnae's Committee on Nominations for the Corporation Visiting Committees; and six members nominated by the president of MIT.

Committees meet on campus once every two years. Most committees convene for a day and a half of discussions, followed by a final half-day session to provide feedback to the president, provost, chair of

the Corporation, and other senior administration. Each committee chair prepares a written report that is distributed to the Corporation, senior administration, and the department head. Copies of these reports may be found in the accreditation team room; they contain considerable contextual data, including statistics on faculty tenure, underrepresented faculty and students, enrollments, research expenditures, and departmental funding. After the written report has been approved by the Executive Committee, the chair of the visiting committee presents an oral report and leads a discussion at the next Corporation meeting.

In preparation for MIT's October 2009 accreditation process, we conducted a review of all the visiting-committee reports from 2005 to 2009 and interviewed members of each department. The data reinforce anecdotal observations that the visiting-committee system is well respected and plays a key role in identifying challenges, suggesting ways to improve student learning, and providing objective yet informed advice to the departments and the Corporation. For example, the 2007 Visiting Committee for the Department of Urban Studies and Planning reported that since its previous visit and its recommendation to increase the size of the undergraduate program, the number of students majoring in urban studies and planning had grown by 50 percent. The 2006 Visiting Committee for the Media Laboratory and Media Arts and Sciences applauded the implementation of its recommendation to develop a multitrack educational program for students. Similarly, the 2007 Visiting Committee for the Whitaker College/Harvard-MIT Division of Health Sciences and Technology cited significant progress on earlier recommendations, including the implementation of dual and joint faculty appointments with departments in the School of Engineering and the School of Science.

Recently, the chairman of the Corporation reiterated that visiting committees should explicitly address faculty diversity, and departments should be held accountable for their progress in this area. In addition, visiting-committee members usually discuss issues of student learning with faculty and current students, although their findings are not always highlighted in the written reports. While issues of space allocation, faculty renewal, and graduate fellowship support are commonly discussed, the highly targeted nature of each visiting committee makes it challenging to draw comparisons or make broad generalizations based on the reports. For specific examples of visiting-committee outcomes, please see the E Schedules.

In addition to the reports prepared at the time of each biennial meeting, visiting-committee chairs routinely meet with the head of their department approximately 12 months after the last visiting-committee meeting. These mid-course meetings provide opportunities to discuss progress on the committee's recommendations and to address issues of concern that came to light at the prior meeting.

II. KEY AREAS OF INSTITUTE-WIDE PLANNING AND EVALUATION

MIT's culture fosters innovation by bringing together the talents of faculty, students, and staff to define problems, identify needs, and construct solutions. This is a model for MIT's approach to engineering puzzles, intractable global problems, and its own institutional planning. While many universities create a single overarching document articulating a strategic plan, MIT's president, provost, and chair of the faculty regularly convene committees or task forces to develop strategies for the Institute's educational programs and research agenda. Recent initiatives include the International Advisory Committee, the Global Council, the Environmental Research Council, the Race Initiative, as well as committees on technology transfer, managing potential conflicts of interest, open access publishing, promotion and tenure, and faculty quality of life.

These groups use data and analysis to drive engaging discussions, seek broad stakeholder input, and prepare thoughtful and comprehensive reports that are shared broadly. The results are practical institutional strategies built around broad themes such as refreshing our curriculum, supporting our

long-standing tradition of interdisciplinary collaboration, and expanding MIT's global engagement. We explore each of these topics below.

The Institute has recently entered a period of expanded strategic imagination and, and necessarily, greater levels of collaborative planning. Examples of this increasingly coordinated approach can be found throughout this report.

- This chapter's section on interdisciplinary research frames our collaborative "visioning process" to integrate the ideas of MIT's senior academic leaders at an institutional level.
- Chapter 8, "Physical and Technological Resources" describes how MIT's physical resources are planned, designed, and constructed to foster the academic and research pursuits of faculty and students.
- Chapter 9, "Financial Resources" examines how MIT created a framework to strengthen financial-planning capabilities in support of academic priorities.

Perhaps no example better demonstrates our increasingly collaborative efforts than the work of the recent Institute-wide Planning Task Force – a broad, deliberate, and inclusive process in which all branches of MIT are working together to reassess priorities and the use of resources. The work of the Institute-wide Planning Task Force, composed of approximately 200 faculty, student, and staff members, is described throughout the report.

Curricular renewal

The most exciting advances in the worlds of science and technology require the Institute to continually reassess whether the content of its education is appropriate for the changing landscape of discovery. For this reason, MIT's departments undergo regular planning and evaluation to renovate their curriculum in dynamic ways. Changes since the last accreditation visit include a new major in biological engineering; the merger of ocean engineering and mechanical engineering; curricular revisions in both the Civil and Environmental Engineering Department and the Electrical Engineering and Computer Science Department; and the addition of several new minors.

Beyond these departmental changes, the Institute regularly convenes Institute-wide planning groups to help construct an educational infrastructure that prepares MIT graduates for a lifetime of learning in a rapidly evolving world. This theme was initially addressed in 1998, at the time of MIT's last accreditation visit and the coincident report of the Task Force on Student Life and Learning. That report stimulated a decade-long effort to transform student life, residential life, and the physical campus, so that MIT remains a vibrant academic community well into the 21st century.

In 2003, then-president Charles M. Vest appointed a succeeding committee, the Task Force on the Undergraduate Educational Commons (UEC), to address the recommendations of the Student Life and Learning Task Force. In the introduction to its report, the UEC Task Force explained that "the work to be done in the coming years to renew the undergraduate curriculum must be seen as continuing the comprehensive educational reform begun here a decade ago. Strengthening the triad of education, research, and community remains the ultimate goal."[6]

The Task Force included more than two dozen faculty members representing a wide range of academic disciplines, as well as a significant number of students and professional staff. Over the course of two and a half years, the Task Force consulted widely with groups and individuals throughout the MIT community. It met with standing faculty committees, particularly the Committee on the Undergraduate Program and the Committee on Curricula, to discuss the General Institute Requirements (GIRs)—the core classes that all MIT students must take. An expanded version of the Humanities, Arts, and Social Sciences (HASS) Overview Committee was charged with making a thorough review of the

[6] MIT, *Report of the Task Force on the Undergraduate Educational Commons* (October 2006), p. 3.

undergraduate HASS Requirement. The Task Force also held a series of listening events with the faculty of each academic unit of the Institute, and it organized two Institute-wide public forums on its deliberations. Additionally, in an effort to gather diverse insights into the undergraduate experience, a Student Advisory Committee was formed to gather input from student groups. The Task Force released its report in October 2006, which led to more discussions within the MIT community.

In October 2007, the Committee on the Undergraduate Program appointed an Educational Commons Subcommittee (ECS) charged with reviewing and refining the Task Force work, with the ultimate goal of proposing a set of concrete changes to the general MIT undergraduate curriculum. Chapter 4, "The Academic Program," provides more detail about the Task Force report, the work of the ECS, their recommendations, and plans for the future.

Interdisciplinary research

Planning at the Institute is strongly influenced by our focus on interdisciplinary research. Like our peers, MIT is composed of traditional schools and academic departments that have research components. However, the Institute also has an unusually large number of interdisciplinary research centers and laboratories. These collaborations underscore the remarkably low barriers between MIT's departments, and their prevalence can be traced to the Institute's historical role in World War II.

To serve the war effort, MIT was challenged by the U.S. government to help develop radar technology. No single department was equipped to accomplish this task, so faculty from MIT and elsewhere, from many different disciplines, combined forces at the MIT Radiation Laboratory (RadLab). Their collective efforts designed almost half of the radar systems deployed in World War II and set the stage for decades of fruitful interdisciplinary research initiatives at MIT. In 1946, the RadLab was succeeded by the Research Laboratory of Electronics, which remains a leader in the interdisciplinary approach to problems in science and engineering.

Today, more than 50 such interdepartmental research centers are thriving at MIT. This foundation of interdisciplinary work provides an advantage in this moment, when solutions to the world's most pressing problems are emerging at the interface of traditional disciplines. Two examples demonstrate the breadth and scope of some of these collaborations:

- The largest interdepartmental laboratory on campus is the MIT Computer Science and Artificial Intelligence Laboratory, or CSAIL, which was created in 2003 by the merger of the Artificial Intelligence Lab and the Laboratory for Computer Science. CSAIL's 90 principal investigators and 800 members hail from seven academic departments—Electrical Engineering and Computer Science; Mathematics; Aeronautics and Astronautics; Brain and Cognitive Science; Mechanical Engineering; Media Arts and Sciences; Earth, Atmospheric, and Planetary Sciences; and the Harvard-MIT Division of Health Sciences and Technology. The primary mission of CSAIL is research into diverse aspects of computation and artificial intelligence. Over the past four decades, members of CSAIL and its predecessors have been responsible for many innovations in computer science and information technology, including time sharing, public-key encryption, bit-mapped displays, the Internet Protocol Suite (commonly known as TCP/IP), personal workstations, Web standards, computer vision, computer speech, and robotics.

- The Microsystems Technology Laboratory (MTL) is an interdepartmental lab dedicated to fostering research and education in semiconductor and device technology and in integrated circuits and systems design. Founded in the mid-1980s, the lab seeks to realize visions for new systems that are possible only through the integration of multiple disciplines with micro- and nanotechnology. The MTL community is involved in diverse projects that include harvesting the energy of a flying moth to power electronic circuits; developing new electronic devices with graphene, a zero-bandgap material that could revolutionize microsystems; and advancing

organic semiconductors to create large-area, mechanically flexible electronic systems such as e-paper, large-area imagers, and rollable displays. MTL provides micro- and nano-fabrication and computer-aided design (CAD) infrastructure to the entire campus. Last year, more than 550 researchers from 38 departments, labs, and centers conducted research using the MTL facilities.

Two recent examples of interdisciplinary activity are the MIT Energy Initiative and the Koch Institute for Integrative Cancer Research. The complex challenges of energy and cancer both require a cross-disciplinary approach.

- The MIT Energy Initiative (MITEI), officially launched in 2006, brings together faculty and students from all five schools to tackle energy issues—from basic science to new technologies, from new designs for buildings and cityscapes to policy and economics. Equally important, MITEI links the Institute to industry through sponsors ranging from established energy suppliers to alternative-energy firms and individual donors. President Susan Hockfield first identified energy as one of MIT's priorities at her inauguration in May 2005. She subsequently established an Energy Research Council (ERC), composed of 16 faculty from all five schools, to explore how MIT could best address the world's energy crisis. After gathering extensive input from other faculty, students, staff, alumni/ae, and key industrial leaders, the ERC submitted a report to President Hockfield in May 2006. In response, MIT launched MITEI in the fall, beginning a new era of energy-related activity. The MITEI program now includes research, education, the management of energy use on campus, and outreach activities that cover all aspects of energy supply and demand, security, and environmental impact.

- The David H. Koch Institute for Integrative Cancer Research, a major new research facility scheduled to open in 2010, is both a physical entity and an organizing body for MIT's cancer research community—over 500 researchers across the Institute. It supports faculty members from many departments, including Biology, Chemistry, Mechanical Engineering, Chemical Engineering, and Biological Engineering. The Institute will leverage its depth of talent by bringing together science and engineering faculty, students, and staff under a single roof with the aim of identifying new, integrated approaches to cancer detection, treatment, and prevention. Along with teaching classes at MIT, Koch Institute faculty train graduate and undergraduate students and postdoctoral fellows in their research laboratories. Plans for the Koch Institute reflect earlier collaborations among MIT faculty who recognized that cross-disciplinary efforts could have an important impact on cancer research.

As indicated earlier, to carry MIT's tradition of cross-disciplinary work into the future, the Institute has entered a period of expanded strategic imagination and more collaborative planning. The Academic Council, chaired by the president, meets weekly during the academic year and includes senior academic and administrative leaders.[7] Over the course of 2008–09, Council members were asked to report on strategic initiatives within their schools or units, and to use the Council as a forum for exploring potential connections across different parts of the Institute. These discussions have been helpful in identifying promising work that crosses disciplinary boundaries and might benefit from synergetic activities with other parts of MIT. As one example, the School of Engineering, in collaboration with the Sloan School of Management and the School of Architecture and Planning, launched the Transportation@MIT Initiative in March 2009. Since that time, some 40 faculty members have come together as part of a major collaborative research project involving expertise from across the schools.

The process of "visioning for the future" will inform the Institute's long-range campus planning for research and education. This process integrates the ideas from many groups that participate in strategic planning. The academic planning of the Academic Council further develops the planning taking place within academic units and helps ensure that local efforts are properly placed within the larger

[7] The Academic Council is described in more detail in Chapter 3, "Organization and Governance."

institutional context. This coordinated path is increasingly important in an era of constrained resources, when it will be necessary to prioritize efforts, minimize duplication, spend cautiously, and end projects that have run their natural course.

In addition to these efforts, the Office of the Vice President for Research and Associate Provost is working with faculty across the Institute to coordinate research planning. The American Recovery and Reinvestment Act (ARRA) of 2009 calls for the federal government to invest approximately $22 billion in research and development before September 2010 to stimulate the nation's economy through job creation and retention, and through innovation. MIT has submitted multiple proposals in response to the program and has already received more than two dozen awards with ARRA funding.

Given the centrality of our research enterprise, interdisciplinary research is a topic that threads throughout this report. Above we have addressed its role in shaping our planning and evaluation efforts; we also address it in later chapters on the academic program, faculty, students, physical and technological resources, and financial resources.

Global engagement

The expanding global connections of the 21st century provide MIT with increasing opportunities to engage in projects and collaborations outside the United States. As President Hockfield noted in a recent speech in India:

> *It has never been more clear that the future of innovation will be told in many, many different languages. In a world with so much talent, no one has a monopoly on good ideas. As researchers, if we are driven to find the most gifted collaborators and the most intriguing ideas, we must be prepared to look far beyond our own backyards. And as educators, if we fail to help our students learn to live and work with their peers around the world, then we have failed them altogether.*[8]

MIT's global opportunities arise from two sources. First, our faculty and students have research and educational interests that often intersect with projects in other countries. This is especially true as communication across national boundaries expands and as international research and teaching interests increasingly complement the Institute's. Second, MIT is widely viewed as a high-value partner by foreign governments, corporations, and universities that increasingly seek to initiate collaborations and share resources with the Institute. These twin forces have been incorporated into the planning and evaluation of our global-engagement strategy.

In 2005, the MIT Faculty Policy Committee issued a set of recommendations for assessing international research or large-scale commitments. These recommendations were designed to help formalize many of the practices and guidelines already being followed and to articulate the guidelines for the MIT community. In spring 2006, a series of 10 seminars on various MIT international activities was presented to the Academic Council, to provide our senior leadership with a shared perspective on some of the institutional issues that arise from these activities. More recently, faculty working groups have been charged with examining the possible expansion of collaborations in several countries and regions, notably India, China, and the Middle East. In addition, the Global MIT website (http://global.mit.edu) was created to catalog the many international activities across the Institute.

A number of general observations about MIT's international engagements and their importance to the future health of the Institute have emerged:

[8] Susan Hockfield, "Universities and the Global Knowledge Economy" (speech to Confederation of Indian Industries, Mumbai, India, November 20, 2007; available at http://web.mit.edu/hockfield/speeches/2007-india.html).

- Many of the most challenging contemporary problems facing researchers and educators transcend national boundaries, and many of the best solutions to these problems are being developed overseas. MIT will encounter increasing opportunities for mutually beneficial, constructive, global engagement in a range of research and educational areas.

- Our students need to be well prepared to live and work in a world that is becoming more interconnected. The MIT community is very "global," especially at the graduate level, but over half of undergraduates do not have experiences abroad while at the Institute. MIT must offer students more opportunities for the types of international learning experiences that will help them become leaders in a more diverse global economy.[9]

- Many MIT faculty conduct successful research abroad, and the Institute values its wide range of global partners. Among the countries/regions with which MIT has significant collaborative activity at the institutional level are Abu Dhabi, China, Cyprus, Portugal, and Singapore.[10] Thus far, MIT has been relatively opportunistic in choosing international partners, largely responding to overtures from foreign institutions. This approach has yielded successful collaborations, but it does not provide an ideal structure for assessing the relative merits of different projects and for building a cohesive strategy for international engagements.

- Given our plans to keep the number of faculty teaching in Cambridge at the current level, it will be critical to balance campus-based faculty efforts with commitments overseas. International programs that decrease the number of campus faculty for extended periods of time have the potential to adversely affect faculty teaching, supervision, and advising capacities on campus. Similarly, any collaboration begun today might limit faculty time and resources for other exciting opportunities that arise elsewhere in the future. The potential impact of any teaching or service "drain" should be carefully assessed for each project that includes substantial faculty time overseas, and this assessment should help guide decisions on the Institute's engagement with the project.

In the context of these and related observations, in spring 2007 Provost Rafael Reif appointed an International Advisory Committee (IAC) composed of senior faculty from the five schools and members of the senior administration. The committee was asked to recommend strategic courses of action regarding MIT's international engagements in the coming decades. The IAC expects to issue a final report to the Academic Council and the faculty in fall 2009 to provide guidelines for determining what kinds of engagements and which countries or regions hold the most promise for successful collaboration on mutual educational and research interests. To a significant degree, MIT's country-specific faculty working groups will shape and articulate these interests further. We expect that MIT's international engagements will reflect the Institute's tradition of integrating research with education, applying knowledge to practice, and working across academic disciplines to encourage creative innovation. In planning a global strategy, the IAC also recognizes that MIT must remain flexible in pursuing research and educational priorities that inevitably change over time.

III. SUPPORT FOR EVALUATION EFFORTS

To help assess all of MIT's academic and research activities, the Office of Institutional Research (IR) systematically collects and analyzes data. IR, which reports to the provost, performs a broad range of services: responding to external requests for data, complying with federal requirements for data

[9] Recommendations at the undergraduate level are contained in the recent reports of the Task Force on the Undergraduate Educational Commons and the Committee on Global Educational Opportunities for MIT Undergraduate Education, which are available in the accreditation team room. Global education is further addressed in Chapter 4, "The Academic Program."

[10] Further information on these collaborations can be found in the accreditation team room.

submissions, submitting data to a number of consortia, maintaining a central database on faculty, conducting survey research, and performing special projects. IR maintains current and historical data on many aspects of MIT's academic and administrative operations, including staffing, finances, sponsored research, space resources, and student outcomes. These data are used to generate metrics such as student-to-faculty ratios, enrollment per faculty, and research expenditures per square foot. In addition, the office produces a number of annual reports at the institutional, school, and departmental levels, including a 10-year profile of each department. These reports are used extensively by the visiting committees and in planning and evaluation efforts.

IR also oversees a broad program of survey research (information on MIT's suite of surveys is available in the accreditation team room). Surveys of faculty provide insight into quality-of-life issues, promotion and tenure experiences, workloads, and concerns about community. While direct assessment of student learning is the responsibility of academic programs, centrally conducted surveys are a mechanism for indirect measurement. These surveys provide valuable feedback not only about undergraduate and graduate education, but also about student life.

Another IR function is coordinating MIT's participation in various consortia-based research programs. These include the Consortium for the Financing of Higher Education, various Ivy Plus groups, the Association of Independent Technological Universities, and the Association of American Universities Data Exchange. Through participation with these groups, MIT can incorporate peer comparisons in studies of undergraduate- and graduate-student outcomes and satisfaction.

IV. PROJECTIONS

Like our peers, MIT has adjusted its planning in response to the global economic slowdown. In the spirit of practicality, creativity, and inclusiveness, we have launched a broad, collaborative effort to design less-expensive, more-efficient processes. In November 2008, MIT's president and provost wrote to the MIT community about the worsening economic environment:

> *Ambitious forward motion is MIT's signature; we celebrate initiative, innovation, relentless improvement, and creative change. Yet as the world's financial markets continue to decline, they forecast a global reduction in resources. In that context, our challenge is clear: together, we must chart a financially prudent path forward, but one that sustains and fosters the essential character of MIT.*[11]

To that end, MIT launched an Institute-wide Planning Task Force, bringing together faculty, staff, and students to assess how we carry out our mission and consider ways to make improvements while reducing expenses. In February 2009, the Task Force was formally charged with reviewing and analyzing current practices and expenditures and with specifically identifying:

- Activities or operations closely aligned with MIT's core mission
- Opportunities for efficiency and cost reduction
- The costs and benefits of proposed operational changes, along with paths to implementation that preserve MIT's mission, values, and culture
- Opportunities to promote environmentally sound, sustainable practices

The Task Force also was charged with maintaining MIT's commitment to:

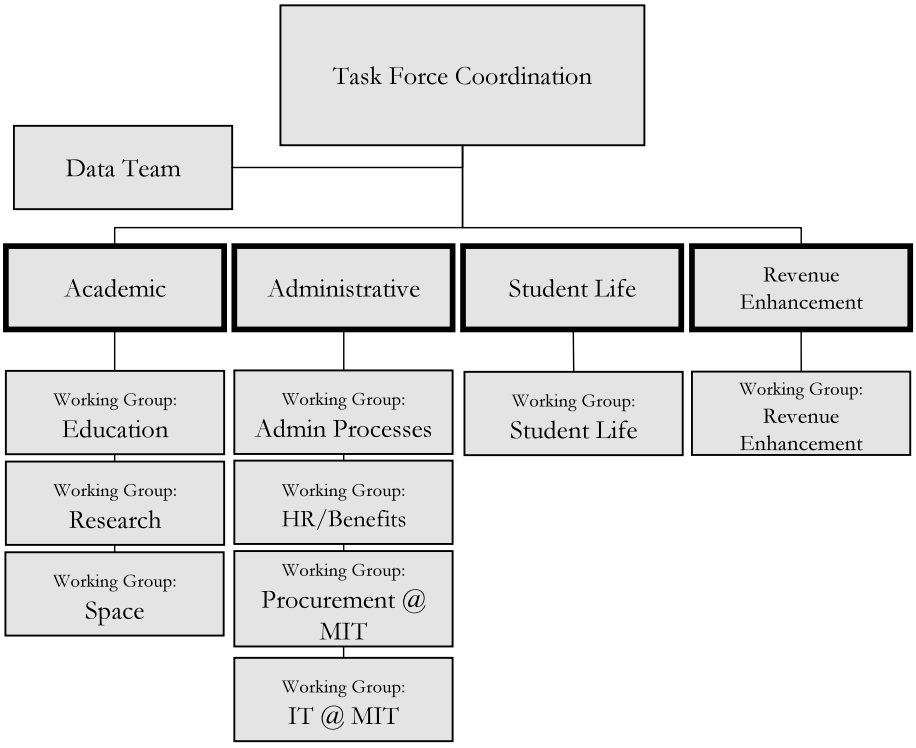
- Its mission to advance knowledge and educate students
- Its unified structure of one faculty, one staff, and one student population, operating under common sets of policies and procedures

[11] Susan Hockfield and L. Rafael Reif, letter to the community on MIT finances, November 2008. Available at web.mit.edu/hockfield/letters/letter11172008.html.

- The pursuit of cutting-edge research that is closely integrated with teaching
- Need-blind admissions and need-based financial aid
- The increased diversity of our community
- Transparent and open communication with the entire MIT community

Wide-ranging in scope, the Task Force has four major areas of focus: academic planning, administrative planning, student life, and revenue enhancement. Two of these areas are further subdivided: academic planning encompasses education, research, and physical space, while administrative planning covers administrative processes, human resources and benefits, procurement, and information technology (see Chart 2A).

Chart 2A: Institute-wide Planning Task Force Organization Chart



Because the Task Force was expected to recommend changes that could affect activities across the Institute, its members—87 faculty, 85 staff, and 20 students—were drawn from a wide cross-section of the MIT community. Each of the nine Task Force working groups was also carefully assembled to include representatives from a wide range of departments, and each is cochaired by at least one member of the faculty.

To provide news, information, and updates about Institute-wide planning, MIT created a website at http://web.mit.edu/instituteplanning. In addition, to encourage participation by the entire MIT community, the Institute launched an online Idea Bank (http://ideabank.mit.edu) where individuals can submit suggestions to the Task Force and comment on posted ideas. The website is designed to summarize ideas for each of the working groups, facilitating each team's ability to engage the community more broadly. The Idea Bank has been greeted with great enthusiasm across the Institute for

its ability to provide a transparent and direct method of communication. In its first six months, more than 3,000 faculty, staff, students, and alumni visited the website and submitted over 1,000 ideas and comments. Some suggestions to transform processes, improve effectiveness, and achieve efficiencies have already been implemented. For example, the Institute is moving toward electronic travel-expense reporting, automation of requests for payment, and direct deposit of reimbursements.

The work of the Task Force is also informed by the ongoing planning in departments and schools to meet the immediate budgetary reductions for fiscal year 2009–10 (described in Chapter 9, "Financial Resources"). Additionally, the Task Force members have consulted widely with department heads, deans, and others with planning responsibility in their particular areas. The working groups have relied heavily on a special Data Analysis Group, formed to supply pertinent financial data and other information necessary to make informed recommendations on the Institute's operations.

The Task Force's preliminary report will be released to the MIT community in August 2009 as our accreditation document is being finalized. Faculty, students, staff, and alumni will be able to comment on the Task Force report via the Idea Bank. Some recommendations are likely to be adopted soon, while others will require several months or years to evaluate and implement. For this reason we are unable to incorporate the work of the Task Force in a substantive way into our narrative report. However, we have included its preliminary report as Appendix 6, we reference its work in almost every chapter, and we look forward to engaging the NEASC evaluation team on the Task Force's findings.

Chapter 3: **Organization and Governance**

I. THE CORPORATION
II. FACULTY
Organization and structure
Faculty committees
Other links to the administration
III. INSTITUTE ADMINISTRATION
IV. STUDENTS
Student governance
Shared governance
IV. PROJECTIONS

MIT derives great strength from its tradition of unified Institute-wide organization and governance. This guiding principle influences structural and behavioral interactions among faculty, students, and staff. Undergraduates apply and are admitted to the Institute at large and may take classes and pursue majors in any school. Emblematic of our cohesive governance structure, the president convenes a weekly Academic Council meeting with the provost, vice presidents, chair of the faculty, all school and student deans, and associate provosts to discuss issues of importance to the Institute. All faculty promotion and tenure decisions are presented to the appointment subgroup of the Academic Council, whose members make an advisory recommendation to the president. Administrators, faculty, and students serve together on more than 30 Institute committees appointed by the president and Corporation. Combined with a culture that strongly promotes interdisciplinary research, MIT's organization and governance structures foster a collaborative approach to Institute planning and problem solving.

I. THE CORPORATION

Just as there is one Institute faculty, a single governing board is responsible for the five schools and the Institute as a whole. The MIT Corporation derives its authority from the charter granted to the Institute by the Commonwealth of Massachusetts (http://web.mit.edu/corporation/charter.html). The Corporation is composed of approximately 78 active and ex officio members and close to 30 emeritus life members.

The MIT Corporation holds a public trust to ensure that the Institute adheres to the purposes for which it was chartered, that its integrity and financial resources are preserved for future generations, and that the needs of the present are appropriately balanced against future needs. The Corporation and its committees are responsible for reviewing and providing guidance on strategic directions, approving annual budgets, and exercising long-term fiduciary responsibility. Their duties also include approving new degree programs or courses of study that emerge from the faculty-governance process; approving degrees; electing the president and other Corporation officers; and being available, individually as well as collectively, to advise the president on issues that may arise.

While the Corporation as a whole meets four times yearly (generally the first Friday of October, December, and March and on Commencement morning), the majority of the Corporation's work is conducted through its various committees. These include the Executive Committee, the Investment Management Company Board, the Audit Committee, the Membership Committee, the Corporation Joint Advisory Committee on Institute-wide Affairs, and the Screening Committee for recent graduates. In their capacity as Corporation members, individuals also serve on multiple visiting committees. As described in Chapter 2, the visiting committees play a central role in both the governance and the evaluation of Institute functions. The financial oversight and management roles of the Corporation are described in Chapter 9, "Financial Resources."

The Executive Committee, which is charged with "responsibility for general administration and superintendence of all matters relating to the Corporation,"[12] meets approximately 10 times each academic year. The president chairs the Executive Committee, which devotes substantial time to considering budget processes, financial planning, campus facilities, and academic planning. In recent years, the Executive Committee has had discussions about MIT's global-engagement strategy, campaign planning, and restructuring the Institute's financial framework, which resulted in the first balanced budget in many years. Over the last year, the Executive Committee met with each of the deans regarding academic planning, and it devoted considerable attention to the Institute's response to current financial conditions.

Further details on the Corporation, the work of its committees, and its membership may be found online (http://web.mit.edu/corporation) and in the accreditation team room.

II. FACULTY

Organization and structure

Although members of the MIT faculty are organized into the conventional structures of departments and schools, a longstanding tradition of Institute-wide faculty governance promotes a philosophy of "one faculty." Similarly, MIT's intellectual culture promotes the cross-fertilization of ideas through collaborations among its labs, centers, and programs, which bring together faculty from across the Institute. The departments provide long-term stability and the necessary structures to advise and mentor undergraduates, admit graduate students, hire and promote faculty, and award degrees. However, the myriad multidisciplinary initiatives make it easy to "go where the action is," regardless of one's primary academic appointment. The Energy Initiative is a particularly strong example. MITEI supports research in each of the five schools, including 17 different departments and numerous labs and centers. The Undergraduate Educational Commons Task Force attributed this unity of the faculty to mutual professional respect and consensus "that the entire MIT faculty [is] responsible for the education of undergraduate students. The reasons for this are twofold: first, to ensure that the undergraduate program is balanced; and, second, to ensure that the undergraduate program keeps pace with intellectual frontiers represented by the research activities of the entire faculty."[13]

While individual departments and schools regularly hold meetings, all are invited to come together for Institute-wide faculty meetings. Held monthly during the academic year, these meetings not only address matters relating to educational policy and undergraduate and graduate degrees, but also review recommendations and reports that have emerged from the Institute-wide faculty governance structure. Open to the entire MIT community, faculty meetings include a question-and-answer period with the president, provost, and chancellor.

The governance of the faculty is defined in the Rules and Regulations of the Faculty (http://web.mit.edu/faculty/rules). The officers of the faculty are its elected chair, associate chair, and secretary, and, ex officio, the president of the Institute, who is president of the faculty.

Faculty committees

The faculty develops and carries out policy through its standing committees, almost all of which include student members. The standing committees of the faculty are the following: Faculty Policy, Graduate Programs, Undergraduate Program, Curricula, Undergraduate Admission and Financial Aid, Academic Performance, Student Life, Discipline, the Library System, Outside Professional Activities, and Nominations.

[12] Bylaws of the MIT Corporation, Section 14.2.4 (http://web.mit.edu/corporation/bylaws/by14.html).
[13] MIT, *Report of the Task Force on the Undergraduate Educational Commons* (October 2006), p. 16.

Of particular importance is the Faculty Policy Committee (FPC). The FPC maintains a broad overview of the Institute's academic programs, deals with a wide range of policy issues of concern to the faculty, and coordinates the work of other faculty committees. After review, the FPC forwards the requests of the standing committees to the full faculty meeting for voting. The FPC is chaired by the chair of the faculty and includes eight additional faculty members, one undergraduate student, one graduate student, two nonvoting members designated by the provost, and one nonvoting member designated by the president. Both the president and the provost meet with the FPC each year.

Ad hoc committees are periodically formed to address particular issues and report back to the entire faculty. For example, different committees are current focusing on open-access publishing, promotion and tenure processes, and quality of life for faculty.

The committee system allows faculty members to examine issues in more depth than would be possible if items were presented only at the monthly meetings. Without faculty committees, certain changes, especially those related to the curriculum, could not be enacted. While certain committees overlap somewhat in their purview, that provides an effective safeguard to ensure that ideas are vetted, often multiple times, to key stakeholder groups. The committee system also gives students a voice in the process, as students are represented on all standing committees except Nominations. Chapter 4, "The Academic Program," discusses the efforts of faculty committees to ensure that MIT's educational programs keep pace with advances in research, technology, and pedagogy.

Other links to the administration

Several informal structures also contribute to a strong working relationship between the Institute administration and the faculty. The president meets with past chairs of the faculty to hear their perspectives on issues facing the Institute. The president also meets monthly with the faculty officers to develop and plan the agendas for faculty meetings. As mentioned above, the chair of the faculty is a member of the Academic Council (AC), and he or she therefore can speak on behalf of the faculty in AC meetings. Throughout the academic year, the president also hosts monthly meetings of department heads from across the Institute to discuss important issues.

III. INSTITUTE ADMINISTRATION

Just as MIT's structures and philosophy reinforce the unity of the faculty, they bolster an unusually high degree of unity in its administrative functions. The Academic Council anchors this cohesion. Chaired by the president, the AC consists of the Institute's senior academic and administrative officers plus the elected chair of the faculty. The AC meets for two hours weekly during the academic year to confer on matters of importance to the Institute. In addition to its role as a central deliberative body, the AC is a vehicle for discussing and coordinating school-specific efforts. Each of the school deans is currently engaged in an academic planning process (see Chapter 2), which was reviewed at AC retreats and meetings throughout 2008–09. As outlined in Chapter 5, "Faculty," a subgroup of the AC—including the president, the provost, the five school deans, the three student deans, the associate provosts, and the director of libraries—reviews tenure recommendations proposed by the individual schools.

MIT's senior-leadership structure is shown on the Institute's organization chart (found in Appendix 1, Prefatory Matter, and online at http://web.mit.edu/orgchart/). The Corporation bylaws vest authority in the president; she, in turn, partners with members of her senior staff on key leadership functions. The provost and chancellor have oversight responsibility for MIT's academic program. The provost, as the Institute's chief academic officer and chief budget officer, is responsible for academic and financial planning and for MIT's research mission. In this role, the provost convenes a weekly Deans' Group meeting that, in addition to the five school deans, includes the three student deans, the chancellor, the vice chancellor, the chair of the faculty, and the associate provosts. Collectively, the group discusses academic issues that cut

across the Institute such as teaching policies, subject evaluation, core requirements, and graduate-student support.

The chancellor oversees undergraduate and graduate education and student services. During MIT's last accreditation, a lack of clarity was noted in regard to the respective roles of the provost and the chancellor. The original role of the chancellor has evolved, and the chancellor is now understood to be a highly visible senior representative of student issues within the administration. In June 2008, MIT announced the creation of a new vice chancellor position to serve as a full deputy supporting the chancellor on operational issues across all student and educational areas for which the chancellor is responsible. The first vice chancellor appointed was the dean for graduate education who currently serves in both positions. Together, the chancellor and the vice chancellor and dean for graduate students work with the deans of undergraduate education and student life on initiatives impacting students, such as community, diversity, and leadership.

As the Institute's chief fiduciary officer, the executive vice president (EVP) and treasurer is responsible for leading all administrative and financial functions at MIT. He or she works with the president, the provost, the Corporation, and the senior leadership team to ensure that MIT's financial, capital, and operational resources are optimally deployed to support the Institute's academic mission of education and research. The EVP and treasurer also is responsible for financial-strategy development, capital-budget planning, debt issuance, and the integrity of financial reporting. The role of the EVP and treasurer, and MIT's Office of Budget, Finance, and Treasury are further described in Chapter 9, "Financial Resources."

Several other organizational changes have taken place at the senior administrator levels. In 2007, MIT appointed its first general counsel. The new Office of the General Counsel is MIT's internal law office and includes all practicing attorneys employed on campus. This consolidated office replaces MIT's prior system, whereby lawyers worked in various units scattered throughout the Institute. The Office of the General Counsel allows MIT's lawyers to work cooperatively and more efficiently, and it provides for consistency in legal advice, broader risk management, and one central point of contact for MIT's legal services.

After experimenting with the organization of its communications efforts, in 2008 MIT restructured many of its internal and external communications functions in the Office of Institute Affairs. This newly configured office handles news, public relations, the MIT homepage, and selected publications and public events. The Office of Institute Affairs takes a holistic view of happenings on campus and maximizes access to news and information for both the MIT community and the public at large. To better serve this mission, in January 2009 the Institute combined some of the communications activities of the News Office and MIT's magazine, *Technology Review*, under one management. Although *Technology Review* retains its own governance structure and editorial independence, this reorganization eliminates duplicative functions, lowers expenses, and improves the quality, range, and reach of editorial services offered by both *Technology Review* and the News Office.

In another administrative change since the 2004 interim report to NEASC, the Institute has appointed two associate provosts for faculty equity. See Chapter 5, "Faculty," for more details.

IV. STUDENTS

Student governance

All undergraduates belong to the MIT Undergraduate Association (UA). This student-government body seeks to improve student life at MIT and serves as a liaison between undergraduates and the MIT faculty, staff, and administration. Much of the UA's work is conducted through committees. Especially notable

are the Finance Board, which coordinates budgets and allocates funds to student organizations; the Student Committee on Educational Policy, which provides student feedback to the departments and the Institute on important educational issues; the Committee on Nominations, which recommends student representatives for more than 50 administrative and faculty committees; and the Events Committee, which produces major social events including autumn and spring weekends. Each undergraduate class annually elects a president and an executive committee to handle class activities.

All graduate students are represented by the Graduate Student Council (GSC), which consists of elected representatives from all academic departments and graduate residences, as well as members at large. The GSC organizes and encourages academic, athletic, cultural, social, and other cocurricular activities; promotes closer relations between graduate students and the faculty outside formal academic contexts; and voices the concerns, ideas, and suggestions of graduate students. In addition, the GSC nominates two students to serve on the Committee on Graduate School Programs and one to serve on the Faculty Policy Committee, and it is represented on many other Institute committees as well. The Council's graduate officers (president, vice president, secretary, and treasurer) meet weekly with the dean for graduate education and the dean for student life to collaborate closely on matters of importance to graduate students. Among the GSC's notable contributions are (1) annual recommendations to senior administrators about stipends for research assistants, teaching assistants, and fellows, based on a cost-of-living analysis produced from surveys and government inflation statistics; (2) the proposal and implementation in spring 2009 of a pass/D/fail grading option for graduate students, which encourages them to explore new subjects and broaden their educational experiences; and (3) the creation of the first-ever dental plan for graduate students, implemented in fall 2008.

The Association of Student Activities, a joint committee of the UA and the GSC, is responsible for recognizing student groups and activities, allocating resources, and organizing an activities fair during MIT's fall orientation.

Multiple student-led governance organizations serve the fraternities, sororities, and independent-living groups at MIT. The Interfraternity Council governs the 26 fraternities, the Panhellenic Association oversees the sororities, and the Living Group Council represents the five independent-living groups. Each of these governance organizations represents its constituents in dealings with the MIT administration and faculty. In addition to fostering the exchange of information so that each group may learn what the others have to teach, these organizations encourage cooperation and interaction to improve intergroup relations. More information about residential life and student organizations can be found in Chapter 6, "Students."

The Dormitory Council is the governing body of all MIT undergraduate residence halls. Its purpose is to engage in those activities that cannot be better performed by the individual house committees. The voting members of the Council are the house presidents, although all house residents are members and may attend meetings. The Council's main function is to act as a student advocacy group, representing the interests of all dormitory residents to the administration.

Shared governance

In addition to the student-led organizations detailed above, undergraduate and graduate students participate on most of the standing committees of the faculty and on more than 30 Institute committees that also include faculty and staff members (http://web.mit.edu/committees/president). MIT administrators worked closely with students in 2003–04 on the search for MIT's new president, when a student-managed committee on the effort ran in parallel with committees of the Corporation and the faculty. The student committee recommended issues to explore during the search and suggested candidates for consideration. In a little-known but significant departure from tradition, two graduate students and two undergraduates interviewed final candidates for the position. Overall, the student involvement with the process was considered highly successful.

To ensure that the interests of recent graduates are represented in Institute-wide governance, the Corporation reserves five of its membership slots for graduating students and recent alumni/ae. These members play an important role in connecting the administration, the trustees, and the student population. Through the visiting-committee process, undergraduate and graduate students have opportunities for direct interaction with Corporation members. Corporation members also meet with students in the Corporation Joint Advisory Committee on Institute-wide Affairs (CJAC). CJAC is unique in that it brings together members of the Corporation, undergraduate and graduate-student representatives, and faculty appointees, but not members of the administration, to address issues shared across the Institute. Concerns arose in recent years that this group was not as effective as it could be. In 2008, the chairman of the Corporation, the president, and the secretary to the Corporation launched a plan to infuse CJAC with fresh energy and more focused discussion. During 2008–09, CJAC conducted an informal review of MIT's efforts to implement recommendations from the September 1998 *Report of the Task Force on Student Life and Learning*. Committee members assessed progress to date and identified remaining and new challenges. Their report (available in the accreditation team room) was distributed to the Corporation and discussed at its March 2009 meeting.

IV. PROJECTIONS

Although MIT's tradition of Institute-wide governance and committee-driven work has served us well, we continue to make changes and improvements to reflect the evolving needs of the Institute. The Humanities Visiting Committee, for example, has been challenged by the vast intellectual scope of its portfolio.[14] As a result, in 2009-10 the Committee will split into two new committees: one focusing on the humanities and the other on the social sciences. These are the first new committees since a Visiting Committee for Student Life was created in 2001–02. The Institute's increasing focus on global engagement is also influencing how we think about our governing board. Ten years ago, nearly all members of the Corporation and visiting committees were American MIT alumni. Because many of today's complex challenges require an increasingly global perspective, MIT has made a concerted effort to recruit more international leaders and nonalumni to join the Corporation and its visiting committees.

In recent months, issues of communication and transparency have received enhanced scrutiny as MIT undergraduate and graduate students have expressed concern about their role in certain decisions affecting student life. Specifically, some feel that the administrative decision-making process is too opaque and that students have been consulted too late to give meaningful input. In response to these concerns, MIT established the Task Force on Student Engagement in 2007. Chaired by the chancellor, the Task Force is composed of students, administrators, and faculty who are examining existing structures and looking for ways to improve communication and maximize transparency, in order to enhance the educational and community experience at MIT. Additional steps to improve communication between students and administrators include increasing the number of student meetings with the senior administrators who directly serve students, adding more Web-based communication tools, and holding informal dinners with administrators and small groups of students selected by lottery.

CJAC, as part of its 2009 report, urged the MIT administration to further involve students in decision making, especially as it relates to upcoming budget cuts. Because student participation is recognized as desirable and beneficial, undergraduate and graduate representatives serve on all nine working groups of the Institute-wide Planning Task Force (see Chapter 2).

[14] Fields of study at the undergraduate level include foreign languages and literatures; writing and humanistic studies; anthropology; history; and the Program in Science, Technology, and Society. Graduate programs include those in comparative media studies, science writing, and HASTS (MIT's doctoral program in history, anthropology, and science, technology, and society).

Given the changing nature of technology and communication, CJAC also suggested that the administration consider additional tools—such as blogs, instant messaging, and Facebook—to reach MIT's broad community of faculty, students, staff, and alumni. Preliminary analysis revealed that every MIT class from 1988 onward has more than 500 alumni/ae members connected through Facebook. To use technology to promote transparency on governance issues, the Institute launched an experiment with the MIT Idea Bank in 2009. As explained in Chapter 2, the Idea Bank is an online forum where all members of the community can discuss how to make MIT more effective and efficient. In addition to putting forward their own ideas, visitors to the website can read other suggestions and rate those with the greatest power to make a difference. MIT's Information Services and Technology department developed the custom-built site with guidance from technology-savvy Corporation members and faculty from MIT Sloan's Center for Collective Intelligence. Within the first six months, the Idea Bank had over 3,000 visitors who submitted more than 1,000 ideas. The Task Force on Institute-wide Planning reviewed the suggestions and acted on many. Given such positive response to the site, other MIT offices and initiatives are incorporating the Idea Bank model into their efforts to communicate in a transparent and technologically relevant way with students, faculty, and staff.

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MIT students are living in a dynamic age. They study with a diverse group of peers in a world that seems much smaller today than it did at the time of the last NEASC visit 10 years ago. Scientific and technological innovations occur at rapid speed. New academic pursuits blur traditional disciplinary lines and open up exciting new ways to address problems that seemed unsolvable five years ago. New technologies raise undreamed-of ethical issues in the context of an evolving society. How will the Institute ensure that its academic program, which is anchored in MIT's rigorous science and technology tradition, remains flexible enough to address this changing landscape? For much of the last decade, this question has motivated curricular thinking at the undergraduate level and influenced the direction of the graduate program. It also has inspired the many changes made to MIT's living and learning environment since the last accreditation visit. As we evolve, we remain committed to our institutional mission—today and tomorrow. For this reason, we have used excerpts of our mission statement to help frame and organize much of this chapter.

I. THE UNDERGRADUATE PROGRAM

> *The mission of MIT is to … educate students in science, technology, and other areas of scholarship that will best serve the nation and the world.*
>
> — MIT mission statement

General Institute Requirements

MIT is organized into academic departments that carry a number and are called Courses (for example, civil and environmental engineering is Course 1; mechanical engineering is Course 2). The academic departments offer undergraduate degrees (majors) and minors. A complete listing of bachelor degree programs and minor degree programs may be found in Appendix 7.

When students apply to MIT, they are applying to the entire Institute, not to a specific major or school. All first-year students begin MIT with an undeclared major. At the conclusion of the first year, students may choose any major without any additional requirements or admission procedures. The General Institute Requirements (GIRs) help provide a common core of prerequisite knowledge that virtually all departments depend on for the success of their majors. In addition, the GIRs provide the foundation for a general, well-rounded education at MIT. The GIRs are described in detail at http://web.mit.edu/catalogue/overv.chap3-chart.shtml. Generally, they cover three discrete areas with different requirements.

- *Science Requirement*: MIT expects its graduates to have an understanding and appreciation of the basic concepts and methods of math and science. This understanding is needed for most degree programs at the Institute, but more important, it is an essential part of the background that MIT graduates bring to their roles as professionals and as broadly educated citizens in a world strongly influenced by science and technology. The science core includes two calculus subjects (single and multivariable), two physics subjects (electricity and magneticism, and classical mechanics), one molecular-biology subject, and one chemistry subject. Included in the GIRs are two restricted electives in science and technology (REST) and one Institute laboratory (see http://web.mit.edu/catalogue/overv.chap3-gir.shtml#lr). Students have a choice in these subjects, but the requirements, particularly in REST, are often captured by particular majors to meet departmental requirements. In addition to providing a rigorous introduction to key concepts, the science core is intended to stimulate and challenge each student to review critically his or her knowledge and to explore alternative conceptual and mathematical formulations that may provide better explanations of natural phenomena or lead to better applications of technology.

- *Humanities, Arts, and Social Sciences (HASS) Requirement*: This requirement is intended to ensure that students develop a broad understanding of human society, its traditions, and its institutions. Students must take at least eight HASS subjects. Three of these must be chosen from a designated list of distribution subjects, which may be taken at any point in the student's undergraduate career. The distribution subjects are arranged in five categories: (1) literary and textual studies; (2) language, thought, and value; (3) visual and performing arts; (4) cultural and social studies; and (5) historical studies. Students must also select a field of concentration and study three or four subjects in that field. Currently, 30 concentrations are available to students (see http://web.mit.edu/shass/undergraduate/hass-req/concentration/fields/index.shtml). The objectives of the HASS program are to develop skills in oral and written communication; knowledge of human cultures, past and present, and of the ways in which they have influenced one another; awareness of concepts, ideas, and systems of thought that underlie human activities; understanding of the social, political, and economic framework of different societies; and, finally, sensitivity to modes of communication and self-expression in the arts. In May 2009, MIT's faculty approved changes intended to simplify the current HASS Requirement and provide students with greater choice in their HASS subjects. Starting no later than fall 2011, incoming undergraduates will have to take one distribution subject in each of three categories—humanities, arts, and social sciences. The changes in

the HASS Requirement are fully addressed later in this chapter, under "The Undergraduate Educational Commons."

- *Communication Requirement*: A major change to the GIRs since the 1999 accreditation is the introduction of the Communication Requirement. As described in MIT's interim report to NEASC, the requirement was developed in response to a perceived need for greater communication skills among MIT undergraduates. Applied first to the class of 2005, the Communication Requirement replaced a two-phase competency-based Writing Requirement with an instructionally based sequence intended to help students write and speak effectively about their major field of study and about general matters. Four communication-intensive subjects are required, two in HASS (CI-H) and two in the student's major (CI-M). The subjects are integrated with both the HASS Requirement and the requirements of the major program, allowing students to simultaneously fulfill the GIRs and their major requirements. Full details are available at http://web.mit.edu/commreq.

In addition to the Science, HASS, and Communication Requirements, physical education (PE) is another GIR, designed to help students lead a balanced, healthy lifestyle. Each student must earn eight PE points (two points per quarterly class) and meet a swiming requirement.

The freshman year

First-year students enter MIT with different academic backgrounds and learning styles, and they may choose from a variety of options to complete the core subjects and prepare for further undergraduate study. A typical first-year program includes five of the six science core subjects in mathematics, physics, biology, and chemistry, and two of the eight HASS subjects. Students may round out their programs with electives, typically including a seminar.

As an alternative, first-year students may participate in one of four learning communities: the Experimental Study Group (ESG), the Media Arts and Sciences (MAS) program, Terrascope, or Concourse. Approximately 20 percent of the freshmen (200 students) choose one of these options.

- ESG specializes in self-paced, independent study, with small groups of students meeting regularly with tutors.
- In the MAS program, all students engage in undergraduate research and attend a breakfast seminar subject together.
- Terrascope emphasizes the role of interdisciplinary collaboration in tackling complex, real-world problems.
- Concourse emphasizes small class size and extensive personal interaction with senior faculty to provide students with the intimate atmosphere of a small school while retaining all the excitement and resources of a large institution like MIT.

Although the programs differ in pedagogy, all four offer a high level of student-faculty interaction and allow students to experiment educationally within a supportive community. In 2005, the Committee on the Undergraduate Program (CUP) reviewed these alternative freshman programs and strongly endorsed their continuation. The CUP concluded that they "provide educational experiences that go beyond conventional classroom teaching and that have considerable value to a significant fraction of our freshman class."[15] Participants consistently acknowledge the contribution of these programs to their learning and to their empowerment as members of the academy.

[15] Committee on the Undergraduate Program, "Report on Alternative Freshman Programs" (April 2005), p. 1. The report is available at http://web.mit.edu/committees/cup/public-docs/CUPRptAltFreshProgs.pdf

Majors and minors

Majors

Approximately 87 percent of MIT undergraduates major in either science or engineering, with a preponderance in engineering (59 percent). Appendix 7 lists the degrees offered, and the degree requirements for each major program are clearly articulated at http://web.mit.edu/catalogue/degre.intro.shtml.

The Office of Undergraduate Advising and Academic Programming (described in Chapter 5, "Faculty") administers the advising system for entering students and provides programming and resources to help ensure academic success. Students are encouraged to explore the entire range of majors available at the Institute. A comprehensive orientation program welcomes all first-year students and introduces them to MIT's vast academic and research opportunities. During this orientation, freshmen meet informally with faculty, staff, and upperclass students, and they explore a diverse residential community that fosters choice and creativity. Throughout the first year, academic fairs, lectures, seminars, and other programs help students determine which major will suit them best. At the conclusion of the first year, students declare a major without being subject to additional requirements or admissions procedures. There is sufficient overlap and flexibility for students to change majors with relative ease in the second year.

Fall-term subjects for all first-year students are graded on a pass/no-record basis. In a change since the 1999 NEASC visit, spring subjects are graded A/B/C/no record. A 2008 report by a special subcommittee of the Committee on the Undergraduate Program (CUP) found that both fall and spring grades (including hidden grades) for freshmen have improved since the grading change was implemented, and although it is impossible to attribute this shift solely to the new grading policy, that is clearly a key factor.[16]

In 2001 MIT added a Sophomore Exploratory Option as an experiment to encourage students to look into classes they might not normally take, to help ease the transition into the sophomore year by creating a flexible grading option and to further consideration of unconventional majors. Through this program, sophomores may designate one class in each of their fall and spring terms as "Exploratory," which can be changed to listener status until Registration Day of the following regular term. No credit is received for listener subjects and they do not appear on transcripts. Between 25 and 30 percent of the sophomores designated a subject as Exploratory each term between fall 2003 and spring 2007, and this number was closer to 35 percent in Fall 2008. The data — both quantitative and qualitative — show that students use and benefit from the opportunity to explore inside and outside their majors, and they do so in ways that were both anticipated and unexpected. Students value the Exploratory Option as a way to try challenging subjects within their newly declared majors and explore subjects in other academic areas at a reduced risk to their grade point average. In a March 2005 survey conducted by the Teaching and Learning Laboratory, 33 percent of students reported that their designation of a subject or subjects as Exploratory was related to their interest in doing a minor or second SB program, and 11 percent reported that it led to their decision to switch majors between their sophomore and junior years. It is clear from the data that students value this flexible grading option highly.[17] Based on the recommendations of the CUP, the faculty voted in March 2008 to make the Sophomore Exploratory Option a permanent grading option.

To further encourage broad exploration of interests, full-time MIT students may take subjects for credit at Harvard University, Wellesley College, the Massachusetts College of Art and Design, and the School of the Museum of Fine Arts without paying additional tuition.

An important change in Institute policy, one recommended by the Task Force on the Undergraduate Educational Commons, will now make it easier for students to major in more than one field. This change reflects MIT's emphasis on multidisciplinary education and the reality that more and more fields of study are

[16] *Report of the Subcommittee of the Committee on the Undergraduate Program: Review of the Pass/No Record Grading and the Sophomore Exploratory*, January 2008. This report can be found in the accreditation team room.
[17] Ibid.

becoming interlinked. Until spring 2008, students could major in one field, or they could pursue two SB degrees by completing departmental requirements in the second field (including 90 additional units), in addition to completing in full the requirements for the first degree. The faculty voted in spring 2008 to authorize a change from double degrees to double majors. A student who plans to graduate in 2010 or later will be able to earn a bachelor's degree with two majors by successfully completing the GIRs and the departmental requirements for each major. During the many discussions of the proposal, a consensus emerged about the advantages of replacing the second SB program with double majors. The review committees, which included both faculty and students, concluded that the additional 90-unit requirement for a second SB had only limited educational value because no clear academic guidelines existed for those units. It was misleading to suggest that students were earning two full degrees, since in pursuing the second degree, they did not repeat the General Institute Requirements or any other general graduation requirements. Thus the term "double major" more accurately reflects the educational content and purpose of the program.

Minors

A number of fields in all five schools offer minor programs that provide significant experience in the discipline. Students may complete up to two minors and those who do have their fields of study specified as part of their bachelor of science degrees, thus earning public recognition for focused work in multiple disciplines. Minor programs consist of five to seven subjects, though generally six. These subjects may count toward General Institute Requirements and departmental program requirements. A student may not take a minor in the area of his or her major, with one exception: students pursuing Course 4 degrees in architectural design or building technology may take a minor in the Course 4 HASS field of history of art and architecture. In addition, minors are not allowed in either field of composite degrees, which combine two different fields (for example, the SB in mathematics with computer science, the SB in humanities and science, or the SB in humanities and engineering).

In response to the increasingly interdisciplinary interests of our faculty and students, a governance structure for a new energy minor was proposed and approved as an experiment at the May 2009 faculty meeting. The energy minor, which will launch in fall 2009, is designed to complement any undergraduate major at MIT. It consists of six subjects (four subjects plus 24 units).[18] A faculty committee with members drawn from all five schools will have primary academic oversight of the program. Experimenting with a novel governance structure, the committee will report to an Inter-School Educational Council. This new approach reflects the multidisciplinary nature of energy education and research, along with a desire to retain the active engagement of all five schools and the many departments that have participated in shaping the minor. The resulting Institute-wide character of the minor is expected to send a strong signal that MIT takes energy seriously and believes energy studies can be coherently coupled with any major.

Academic quality and integrity

MIT's educational programs continuously undergo revision to keep pace with advances in research, technology, and pedagogy. As indicated in Chapter 3, faculty members across the Institute express a shared responsibility for keeping the undergraduate program balanced and aligned with the intellectual frontiers represented by the research activities of the entire Institute. The Rules and Regulations of the Faculty articulate how MIT systematically assures the quality and integrity of its academic programs and the credits and degrees awarded.

Faculty committees are vital to this effort. The Committee on the Undergraduate Program oversees the undergraduate academic experience, including the freshman year and interdepartmental programs, paying special attention to long-term directions. This committee encourages innovation in undergraduate educational policy, and it has authority to approve and supervise limited educational experiments. The Committee on Curricula, is responsible for approving all changes to the academic programs. Chart 4A shows the main

[18] Students are required to take at least one fundamental subject within each of three energy domains—scientific foundations, technology and engineering, and social science. The additional 24 units can include additional fundamental subjects or approved energy electives from an expansive list.

responsibilities of each committee; additional details can be found on their respective websites (http://web.mit.edu/committees/cup and http://web.mit.edu/registrar/subjects/cmtes/coc/index.html).

Chart 4A: Standing Faculty Committees Responsible for Undergraduate Education

Committee on the Undergraduate Program (CUP)	Committee on Curricula (CoC)
• Oversees the total undergraduate program, including freshman-year subjects, undergraduate advising, and interdepartmental programs • Oversees the General Institute Requirements (GIRs), including periodic review of the Communication Requirement (through a permanent subcommittee) • Sets and reviews long-term educational policy • Encourages educational innovation in the undergraduate program, including approving and supervising limited educational experiments	• Oversees changes in undergraduate subjects of instruction • Revises or terminates existing curricula (including majors and minors) • Creates new curricula (including majors and minors) • Makes additions and deletions to the list of subjects that satisfy the REST Requirement and the Lab Requirement • Acts on student petitions for exceptions to the GIRs

Since the last accreditation report, there have been numerous changes to the academic programs, including the approval of a new major in biological engineering, a merger of the Department of Ocean Engineering with the Department of Mechanical Engineering, and the approval of an architecture exchange program with the University of Hong Kong. An overview of curricular changes can be found in the team room.

The undergraduate educational commons

In 2003, then-president Charles Vest convened the Task Force on the Undergraduate Educational Commons to address the goals, content, and structure of the common aspects of MIT's undergraduate education. The Task Force report (http://web.mit.edu/committees/edcommons/documents/task_force_report.html), published in 2006, engendered much feedback on campus.

The Task Force found that overall MIT's curriculum has been highly successful. The Institute provides an education grounded in the fundamentals of science, yet well seasoned with a sophisticated understanding of human culture. MIT produces well-rounded graduates ready to lead and to help confront the world's great scientific challenges. As the Task Force report stated:

> *MIT's curriculum continues to prepare graduates for careers and lives that are varied and rewarding. MIT undergraduates go on to further graduate education at a much higher level than those of our peers, which is just one indicator of the extent to which students educated at MIT are being prepared to pursue their intellectual passions with even greater depth and rigor. Institute graduates pursue careers that take them far from their original majors, which are overwhelmingly in science and engineering. They naturally progress to become entrepreneurs, business leaders, engineers, physicians, and research scientists. Long after they have left MIT, alumni report that creativity and the ability to deal with new challenges were two of the greatest contributions that MIT made to their adult lives.*[19]

[19] *Report of the Task Force on the Undergraduate Educational Commons* (October 2006), p. 7.

As successful as MIT's curriculum has been, the Task Force maintained that alterations were necessary to reflect changes in the nature of science, in culture and society, and in the student population. Concerns were raised about rapidly expanding knowledge, changing cultural norms, a need for creativity and resourcefulness in the technical workplace, and the emergence of new disciplines and subdisciplines. These concerns led to the conclusion that the General Institute Requirements needed to be more flexible. Specifically, the Task Force urged that more opportunities be created for active learning, particularly in the first year, and that curricular predictability and coherence be balanced with creativity and innovation. Pages 34 and 35 of the *Report of the Task Force on the Undergraduate Educational Commons* summarized the group's four major recommendations:

- The requirements for the science core, for the restrictive electives in science and technology (REST), and for a laboratory should be replaced with a single eight-subject requirement covering science, mathematics, and engineering.

- The Humanities, Arts, and Social Sciences (HASS) Requirement should be changed to an eight-subject requirement divided into two major parts: the foundation phase and the concentration phase.

- Experience in living and working with people from other countries should be considered an essential feature of an MIT undergraduate education. The Institute should expand international education programs that have proven successful, and it should seek other opportunities for students to engage in scientific study or work abroad.

- MIT should enhance the infrastructure that supports excellent undergraduate teaching. Among other steps, MIT should improve orientation and first-year advising, upgrade the quality of classrooms and align the mix of classrooms with teaching needs, and document more completely the Institute's efforts to enhance meaningful interactions among students of diverse backgrounds.

The Task Force report was discussed in many settings across the entire MIT community, including Institute faculty meetings, a special edition of the *MIT Faculty Newsletter* in February 2007, and ad hoc meetings with departments, faculty committees, and other interested parties. These conversations have greatly influenced the faculty's continuing work on the GIRs. The overall response to the Task Force report demonstrated that further work was needed to reconcile the structure of the GIRs with the dynamic challenges facing undergraduate education at MIT. Accordingly, in October 2007, the Committee on the Undergraduate Program (CUP) appointed a new subcommittee. The Educational Commons Subcommittee (ECS) was charged with reviewing and refining the Task Force work, with the ultimate goal of proposing a set of concrete changes to the general MIT undergraduate curriculum.

The ECS presented its proposal to the faculty in November 2008. The subcommittee recommended changes to two portions of the GIRs: the Science, Math, and Engineering (SME) Requirement and the Humanities, Arts, and Social Sciences (HASS) Requirement.

With regard to the SME requirement, the ECS proposed the following:

- Establish "flavors" in the existing GIRs to encourage flexibility and innovation in teaching the traditional core material. Flavors, which would focus on core knowledge in each subject, would allow the introduction of contemporary material, different pedagogies, or discipline-specific examples, while maintaining the prerequisite value of the GIRs. The existing biology GIR already offers flavors.
- Establish a new category of required subjects, elements of design. This would include broad design-related knowledge, such as dealing with complexity, approximation, or the design process, which would be relevant for any student at MIT.
- Establish a new type of GIR, to be called SME foundations. This would be a small group of 6- or 12-unit subjects that all MIT students should consider taking, including probability, statistics,

differential equations, linear algebra, thermodynamics, and computation. SME foundations would provide prerequisite value to departmental programs.

With regard to the HASS portion of the GIRs, the ECS proposed these actions:

- Create a special program within the HASS Requirement, addressed particularly to first-year undergraduates, termed the First Year Focus Program. The purpose of these HASS subjects would be (1) to introduce students to key modes of thought and analysis characteristic of scholarship in the humanities, arts, and social sciences and (2) to provide opportunities and materials for a shared conversation among undergraduates, particularly first-year students.
- Simplify the distribution requirement to three categories (humanities, arts, and social sciences) and abolish the separate category of HASS-D subjects. The concentration requirement would remain the same.
- Continue the development of communication-intensive subjects in HASS, taking into account an assessment by the CUP Subcommittee on the Communication Requirement (described later in this chapter).

The ECS proposed that the CUP, through two new subcommittees,[20] oversee implementation and evaluation of the proposed changes to the GIRs. The ECS also recommended evaluation of the effects of the changes on other GIRs, specifically the REST Requirement and the Laboratory Requirement, and on departmental programs.

The ECS proposal was discussed at three faculty meetings before being turned down at a special faculty meeting in February 2009. Although the motion to approve the proposal carried by a simple majority, it failed to receive the three-fifths majority vote required to change MIT's Rules and Regulations of the Faculty.

Disagreement focused on changing the Science, Mathematics, and Engineering Requirement. Several faculty members believe the curriculum is fine and requires no change. For others seeking more flexibility, choice, and excitement in the curriculum, especially in the first year, the ECS proposals did not go far enough. Still other faculty members believe that responsibility for teaching the science core should remain only in those disciplines currently teaching the science GIRs.

Although the comprehensive resolution did not pass as a package, there continues to be much progress in the faculty's efforts to improve the GIRs. Innovations in the science core and REST subjects include ongoing initiatives in math, design and project-based subjects, and a pilot subject in statistics. Faculty groups have discussed the concepts behind and materials for two new categories of GIR classes—elements of design and SME foundations—and specific subjects are being developed and rigorously assessed in preparation for further discussions of GIR reforms in science and engineering. The last several years of developing experimental subjects at MIT have provided a good model for capturing student interest and implementing and assessing curricular reforms. Regular instructor meetings to share experiences and insights have proven useful, as have new assessment tools.

In the most comprehensive development regarding the GIRs, the leadership in the School of Humanities, Arts, and Social Sciences indicated their wish to move ahead with changes to the HASS Requirement, independent of other suggested GIR reforms. At the May 2009 faculty meeting, a proposal to modify the HASS Requirement was overwhelmingly approved. The change will require students to take one subject in each of the three categories—humanities, arts, and social sciences—effective no later than with the undergraduates entering in fall 2011. This change is intended to simplify the current HASS distribution requirement and provide students with appropriate disciplinary range and choice in their HASS courses. Three important aspects

[20] ECS envisioned a Subcommittee on the Science, Mathematics, and Engineering Requirement, and a Subcommittee on the HASS Requirement.

of the requirement remain the same: students must complete eight HASS subjects; concentrations will continue to consist of three or four subjects, depending on the area; and the HASS Requirement will continue to overlap with another GIR, the Communication Requirement, in the two CI-H subjects.

In the same May 2009 vote, the faculty approved the creation of a new subcommittee of the Committee on the Undergraduate Program (CUP) to oversee the HASS Requirement. The faculty also resolved to give high priority in the next several years to encouraging and assessing innovation in the HASS GIRs, including experimenting with pedagogies or interdisciplinary content. In addition, the faculty encouraged the academic deans and faculty in the humanities, arts, and social sciences to continue developing their experimental First Year Focus Program. This set of subjects designed particularly for freshmen is expected to provide foundational training and opportunities for shared conversation on important topics. The CUP will report back no later than the fall semester of 2014 with an assessment of the program; this assessment will include a recommendation as to whether all students should be required to take one First Year Focus subject in partial fulfillment of the HASS Requirement. Examples of recent subjects include Globalization: The Good, the Bad, and the In-Between; Mapping Controversies; and Learning from the Past: Drama, Science and Performance.

Ongoing curricular innovation

We are optimistic about continuing improvements in the curriculum. Innovation in the GIRs, which was attempted before and during the Task Force discussions, addresses some of the comments in the 1999 NEASC team report. Two efforts are particularly significant examples: the introduction of flavors in biology and technology-enabled active learning (TEAL) in physics.

- The Department of Biology offers several different sections of its core GIR offering, 7.01x. While the classes all cover the same basic material—including the fundamental principles of biochemistry, genetics, molecular biology, and cell biology—each one has a distinct flavor. Subject 7.012 is an exploration of current research in cell biology, immunology, neurobiology, human genetics, developmental biology, and evolution. The focus in Subject 7.013 is on applying the fundamental principles to an understanding of human biology. Topics include genetics; cell biology; molecular biology; disease (infectious agents, inherited diseases, and cancer); developmental biology; neurobiology; and evolution. Subject 7.014 focuses on the application of the fundamental principles to an understanding of microorganisms as geochemical agents that play a key role in the evolution and renewal of the biosphere and in human health and disease. Topics include biogeochemical cycles, population growth, ecosystem ecology, and microbial diversity. While the concept of multiple biology flavors is sound, in practice we have found that faculty workloads often preclude all sections being taught every semester.

- TEAL directly responds to the perception that large lectures and recitations, which are typical of first-year subjects in the science core, do not offer the best learning environment for students. TEAL delivers multimedia visualizations to class laptops to teach physics interactively. It combines desktop experiments with visualizations of those experiments to "make the unseen seen." A discussion of TEAL was included in the 2004 interim report to NEASC. Further information on the program may be found at http://icampus.mit.edu/TEAL/default.aspx. Examples of the visualizations used in the second-semester physics subject (8.02) may be found at http://web.mit.edu/viz/EM. TEAL was recently featured in a *New York Times* article.[21] Student reception to TEAL is mixed, but assessments indicate that student understanding and retention of the material is significantly higher than in the traditional lecture/recitation format. An assessment of TEAL can be found in the accreditation team room.

[21] Sara Rimer, "An Interactive Lecture for Modern Times: TEAL Uses Tech to Improve Education," *New York Times*, January 14, 2009.

Independent of other curricular reform, the Subcommittee on the Communication Requirement (SOCR), the permanent CUP subcommittee that oversees the Communication Requirement, undertook an assessment of the implementation of this new GIR. The Communication Requirement was implemented in 2001, taking effect with the class of 2005. The requirement ensures that students get substantial instruction and practice in writing and speaking throughout their undergraduate program. Students must complete at least one communication-intensive (CI) subject per year. Two of the required subjects are chosen from a group of designated subjects offered in the humanities, arts, and social sciences as part of the HASS Requirement. These CI-H subjects provide students with generally useful skills in expository writing and speaking in the context of HASS subject matter. The other two required CI subjects are taken in the student's major department or, in specific instances, a cognate field. These CI-M subjects provide experiences that prepare students for effective communication in their chosen discipline. As a consequence of this structure, a wide variety of communication-intensive subjects (approximately 120 CI-Hs and 134 CI-Ms) are offered in 34 majors across all five schools. These subjects encompass a number of formats, including laboratory classes in which students write, revise, and present lab reports; seminars in which they prepare presentations, lead discussions, and write extensive essays; senior theses; capstone design classes; and independent-research projects.

SOCR found that the Communication Requirement has been well received, with both faculty and students valuing the content and pacing of CI subjects. SOCR will now focus on developing a best-practice inventory for teaching communication skills that will be shared with the MIT community. The subcommittee also plans to work with communication experts from the Program in Writing and Humanistic Studies and its subsidiary, Writing Across the Curriculum, to identify effective teaching collaborations between faculty and other instructional staff.

Over the next several years, SOCR will also work toward establishing criteria for the designation of communication-intensive subjects that focus more directly on educational objectives. This may allow faculty more flexibility in designing CI subjects and integrating CI content. One such experiment has already occurred. Beginning in spring 2007, a number of project-based pilot subjects were designated as CI subjects. In these subjects, students have the opportunity to develop teamwork skills and to integrate knowledge and techniques from different disciplines to complement the traditional science-core subjects. While these subjects will likely continue to be offered, spring 2009 marked the third and final yearlong experiment to award CI credit for some of the subjects. With the conclusion of this experiment, SOCR will report to the Committee on the Undergraduate Program on the lessons learned. Assessments of student performance in these subjects and faculty and student experiences will help inform decisions regarding future experiments.

Meanwhile, in response to recent faculty committee and task force reports encouraging innovation in the GIRs, faculty members have been developing and teaching experimental HASS First Year Focus subjects for several years. Subjects have been assessed, and results reported to instructors and the CUP. Subjects that have been offered repeatedly include How to Stage a Revolution (a history offering) and the Art of the Probable (a literature class), along with interdisciplinary offerings linking anthropology, music, and literature (The Supernatural in Music, Literature and Culture) and theater arts and literature (Learning from the Past: Drama, Science, Performance). In each case, the Teaching and Learning Laboratory found that students appreciated the scope and interdisciplinarity of the subjects, even when they had not considered this last aspect in choosing the class. The experiment continues, as more subjects are being developed, taught, and assessed.

Faculty teaching First Year Focus subjects have met to share their vision, experiences, and ideas with each other and with administrators responsible for assessing the subjects and the program as a whole. Many of the First Year Focus subjects have also been designated CI-H and have served as HASS distribution subjects. With reforms to the HASS Requirement, refining the relationship between First Year Focus and CI-H subjects will be of particular interest in the coming years.

In one example of a recently implemented First Year Focus subject, six different programs in the School of Humanities, Arts, and Social Sciences are collaborating on a new interdisciplinary subject called "Black Matters: Introduction to Black Studies." This subject has two main goals. First, it explores and demystifies certain definitions and (mis)representations of "blackness." Second, it analyzes the power struggles around various ideas of "blackness," and the political and socio-economic consequences of these ideas throughout history and across various disciplines, including anthropology, history, literature, linguistics, writing and the performing arts.

Subjects like Black Matters are part of MIT's commitment to preparing students to succeed in a complex global environment. Our faculty are increasingly addressing issues of diversity and human variation in many areas of their research and teaching. Classes ranging from Gender, Sexuality, and Society to Medicine, Religion, and Politics in Africa and the African Diaspora explore topics of power, ideology, and status in different periods and different cultures. Because they often challenge students' lifelong assumptions and unconscious biases, such courses can be intense, even transformative experiences—powerful preparation for creative leadership in a diverse environment.

With discussion continuing about changes to the General Institute Requirements, the Committee on the Undergraduate Program will be integrally involved with any experiments in subjects proposed for the GIRs and any further action on the Task Force recommendations. One challenge we foresee is that curricular innovation will require additional resources. The dean for undergraduate education has an annual budget to support and encourage imaginative initiatives in subjects, departments, and schools. To date, however, most general curricular innovation has been funded by private philanthropy designated for this purpose. In addition to special funds endowed by alumni classes, the d'Arbeloff Fund for Excellence in Education has been instrumental in providing seed funding for projects to enhance and potentially transform the academic experience of MIT undergraduates. Over the last 10 years, these funds have supported more than 200 projects, for multiple years, resulting in major changes such as TEAL, a FUNdamentals of Engineering subjects, additions to the Course 6 (electrical engineering and computer science) curriculum, an interdisciplinary Bioethics subject, and a flash-forward, flash-back project connecting math concepts in Course 16 (aeronautics and astronautics) subjects.

It will be critical to maintain a pipeline of funding to manage curricular innovation effectively. Our $500 million fundraising initiative, called the Campaign for Students, aims to raise approximately $100 million for various curriculum innovations. The success of that campaign, and the will of the faculty, will dictate how aggressively and quickly curricular change occurs. Additional curricular change funded by the general Institute budget may be constrained by the current budget reductions. Departments, too, may have fewer resources for educational innovation within academic units. Nonetheless, the Institute remains encouraged by the continuing interest in curricular innovation on the part of both the faculty and the school deans. In the years ahead, MIT will need to examine the way it funds and supports curricular experiments to ensure that these innovations continue.

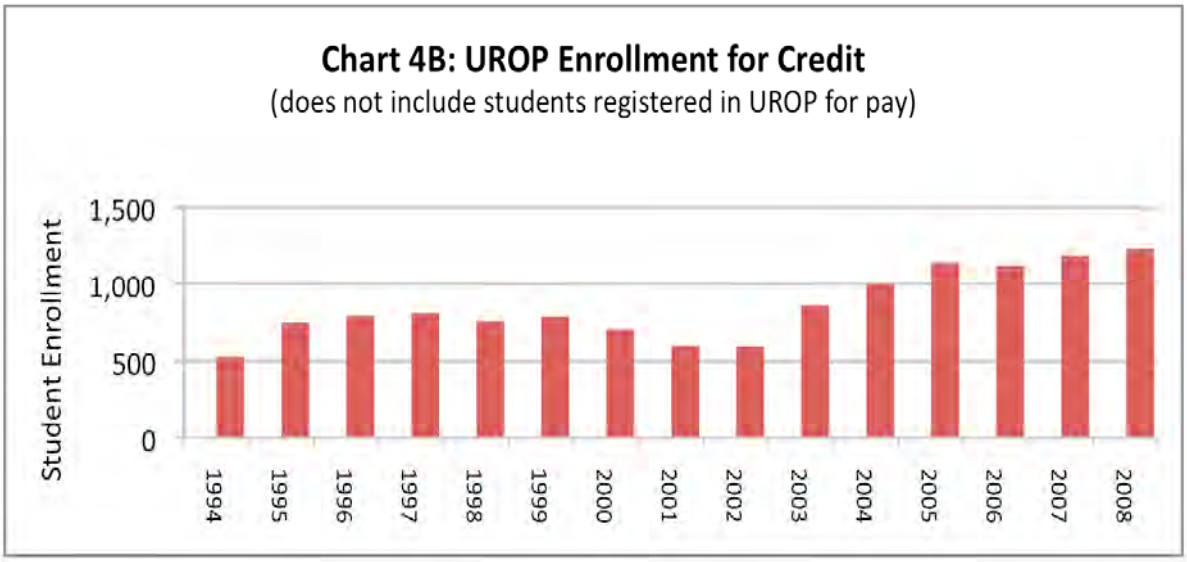
As MIT pursues educational innovation, we are keenly aware of the power of technology to alter the way that students process what they are learning, and consequently change the way they construct knowledge. The work of MIT's Office of Educational Innovation and Technology (OEIT), located within the Office of the Dean for Undergraduate Education, engages in exploratory activities to identify technology-based solutions for new modes of collaboration, production, and the sustainable delivery of educational resources and experiences. OEIT not only acts as a conduit to communicate the availability of educational innovations more widely to faculty but also facilitates the adoption of these innovations, wherever they may have been developed, to help improve teaching and learning at MIT. The office places particular importance on developing and supporting tools and applications for a wide range of courses that advance the recommendations of the MIT Task Force on the Undergraduate Educational Commons. The work of OEIT is described further in Chapter 7, and case studies and publications can be found at http://web.mit.edu/oeit/browse/index.html.

II. RESEARCH AND DISCOVERY IN UNDERGRADUATE EDUCATION

> *MIT is dedicated to providing its students with an education that combines rigorous academic study and the excitement of discovery.*
>
> — MIT mission statement

The Institute's commitment to joining education with the creation of new knowledge has generated a host of scientific breakthroughs and technological advances. MIT's best researchers teach in the undergraduate program, and seniors responding to a 2008 survey reported participating in research with faculty at nearly double the rate of students at peer schools. Independent scholarship and research are an integral part of the Institute's undergraduate programs as well as the foundation for graduate education. As a result, education at MIT is a continuum—any undergraduate may take any graduate subject for which he or she has fulfilled the appropriate prerequisites.

The Undergraduate Research Opportunities Program (UROP) is the best example of students engaging with faculty as junior colleagues in the research enterprise. UROP allows undergraduates to participate with faculty in a wide range of research activities in every department and most interdisciplinary laboratories and Centers. Because of their intensity, rigor, and relevance, UROP projects are the reason many undergraduates now choose MIT. Almost 550 MIT faculty supervise UROPers, and in any given year, the Institute approves more than 2,500 projects (see Chart 4B for enrollment figures). For the past three graduating classes, 85 percent of graduates participated in at least one UROP during their undergraduate career. A survey of 2,700 undergraduates found that UROP projects help students develop research skills and technical expertise, learn to work as part of a team, develop writing and presentation skills, explore fields of study, establish relationships with faculty, and identify a mentor. Almost 12 percent of MIT students publish in a refereed journal before graduating, and UROP participation can also influence a student's decision to go on to graduate or professional school.



Research is also an integral component of regular course work for MIT students. Research facilities often serve as classrooms; students learn about materials science, for example, in micro/nano fabrication labs, and they study nuclear science at MIT's Alcator C-Mod fusion reactor facility. The Institute is further characterized by the myriad classroom activities that introduce students to the excitement of discovery,

starting early in their academic careers. A prime example is the robot-design contest that is a highlight of the first design subject in mechanical engineering (2.007). For a glimpse of other pedagogical approaches that engage undergraduates in their education, see the video *Extraordinary Learning @ MIT* (http://techtv.mit.edu).

The Independent Activities Period (IAP) also provides opportunities for flexible teaching and learning and for independent study and research. IAP takes place over four weeks in January, when faculty members and students are freed from the constraints of regularly scheduled subjects. Students are encouraged to explore the educational resources of the Institute by taking specially designed subjects, arranging individual projects with faculty members, organizing forums, and participating in contests, tours, artistic events, or athletic endeavors. They may also pursue independent interests whether on or off campus. Departmental programs may require students to complete a subject (of no more than 12 units) during one IAP. The 6.270 blog is about a student-managed subject during IAP that teaches students about robotic design by giving them the hardware, software, and information they need to design, build, and debug their own robot (http://www.mitadmissions.org/topics/learning/the_month_of_january_iap/post_11.shtml).

The Institute's renowned Edgerton Center (http://web.mit.edu/Edgerton) is another valuable resource for experiential learning. The Center is dedicated to fostering project-oriented educational opportunities for undergraduates in any discipline. The staff supports activities in high-speed imaging, design for the developing world, educational outreach to grades K–12, digital imaging, electronics, robotics, and underwater instrumentation. The Center also runs a student shop where any MIT student can learn to use machine tools to work on personal projects, team projects, or UROPs. Through invention and discovery, students are better able to master concepts too often presented only in theory through lectures and problem sets. For example, in the Strobe Project Lab, students first learn a variety of high-speed imaging techniques and then apply them to an experimental research project.

The Edgerton Center is home to more than 20 student clubs and contest teams that emphasize hands-on projects. These include a solar electric vehicle team, a Formula SAE team (to design race cars), and several robotics and autonomous vehicle teams. The Center also offers UROPs in many areas and works with the Public Service Center (described below) to integrate community-service projects into the curriculum of a class. For example, students in SP.784, Wheelchair Design in Developing Countries, modify wheelchairs to suit difficult environments found in developing countries. Inspired by working for a wheelchair nongovernmental organization in Zambia, one student developed a bicycle-drawn ambulance that has been adopted by the World Health Organization.

Individual hands-on learning has a long history at the Institute. MIT and its students created the Hobby Shop in 1937 as a place on campus where members could take an idea—one that was not a course assignment or a lab project—and turn it into a working invention. Unlike professional machine shops and laboratories on campus, the Hobby Shop is not affiliated with any one department, and membership is open to anyone at the Institute. On any given day, students might be crafting a new piece of equipment for a lab experiment, creating a new product, or tinkering with an interesting idea for fun. Since 1994, the shop has had over 2,700 different members, including almost 1,400 undergraduates, over 800 graduate students, 40 faculty, and numerous staff and alumni. Beyond fostering creativity and an inclusive, intentional community where individuals with shared interests help each other, the Hobby Shop provides tools and space to bring ideas to life. Students have built storage lockers for families living in a Boston shelter; crafted a hand-held piece of ophthalmologic equipment for use in developing countries; created a specialized bioreactor to facilitate stem-cell research; designed and built stereo speakers and taught others to do the same; and turned pieces of wood into electric guitars and kayaks. The Hobby Shop puts MIT's motto of *mens et manus* into action every day.

Despite the Institute's strong tradition of hands-on learning, the Task Force on the Undergraduate Educational Commons commented on the need for more diverse pedagogies in the first year to excite students about learning: "The first-year curriculum will benefit greatly from the wider availability of project-based experiences that are especially effective at infusing excitement, developing greater creative capacity,

and establishing the importance of self-directed learning."[22] In light of this recommendation, a number of first-year project-based subjects were developed. A complete list of these subjects, with descriptions and photos, is available in the accreditation team room. Also available are the results of rigorous assessments that indicate that the project-based subjects increase students' efficacy in technical problem solving, teamwork, and communication. These experiments have served to inform new thinking on project-based and design experiences across the Institute. We are continuing with existing project-based subjects and also developing new subjects in many areas, including the Bernard M. Gordon – MIT Engineering Leadership Program (described later in this chapter) and the new undergraduate curriculum in Course 6.

III. PREPARING UNDERGRADUATES FOR THE 21ST CENTURY

Much of the discussion in the *Report of the Task Force on the Undergraduate Educational Commons* centered on how best to prepare students to contribute to a rapidly changing world. Ensuring flexibility in the curriculum is key, as noted earlier in the chapter. This section focuses on three additional approaches: emphasizing a global perspective, encouraging the development of leadership skills, and fostering a spirit of service.

Global education

> *The Institute is committed to … working with others to bring … knowledge to bear on the world's great challenges.*
>
> — MIT mission statement

Designing global-education opportunities for science and engineering students poses a particular challenge. Science and engineering curricula include significant core requirements—courses that need to be taken at the home institution. Such classes are typically highly structured and tightly sequenced, making it difficult to find a window when students can go abroad for a semester, much less an entire academic year. A 2008 survey indicated that only 8.8 percent of MIT's graduating seniors had participated in typical study-abroad programs—a smaller percentage than that for liberal arts students but similar to other engineering and science students.

We have responded to the challenge by developing global-education opportunities that are uniquely MIT. As a result, 36 percent of the seniors surveyed in 2009 reported having some kind of international education experience before graduating (up from 24 percent in 2006).

Just as with other aspects of an MIT education, there is a broad range of global activities for students to choose from. These run the gamut from traditional study-abroad programs to innovative short-term projects, but most are infused with the Institute's philosophy of *mens et manus*. One example is MISTI—the MIT International Science and Technology Initiatives—with internship programs in nine countries (see http://web.mit.edu/misti). After several semesters of cultural and language preparation on campus, MISTI students plunge into rigorous, practical work experience in industry and in academic labs and offices. The goal of MISTI is to equip students with a kind of cross-cultural human radar that helps them detect subtle cultural signals and build strong, trusting, productive working relationships across cultural boundaries and around the world. MISTI also organizes the MISTI Global Seed Funds, which encourage MIT students to work on faculty-led international research and projects; the program awarded $500,000 to faculty for international projects last year.

Other successful programs include the Cambridge-MIT Exchange (http://web.mit.edu/cmi/ue/cme-mit/mit-home.html), which allows MIT juniors to study at the University of Cambridge in England; the International Research Opportunities Program, in which students work side by side with foreign researchers overseas; and

[22] MIT, *Report of the Task Force on the Undergraduate Educational Commons* (October 2006), p. 45.

D-Lab and the Public Service Center, which help students undertake hands-on public-service projects in developing countries. Through our Singapore-MIT Alliance for Research and Technology (SMART) Centre, undergraduates spend the summer collaborating on research projects with faculty and students in Singapore. One current undergraduate is creating a 3-D visualization of the country's water distribution network that will display a 24-hour simulation of demand, pressure, and flow through the system.

MIT's offerings respond to the unique needs of our undergraduates by providing options that appeal to varied interests and are manageable within the constraints of a rigorous curriculum. As the Institute considers how to advance global education even further, these distinctive programs provide models for growth. Our expansion strategy will involve an integrative approach that may include modifying the curriculum, boosting instructional capacity in foreign languages and cultures, and adding a small number of targeted academic exchanges with premier universities.

Since our last NEASC evaluation, there have been a number of major developments related to global education at MIT. Ensuring that students gain the skills and knowledge they need to work and contribute internationally is now a widely articulated priority. The Task Force on the Undergraduate Educational Commons stated that every MIT graduate should understand the global context in which their futures will unfold and "be comfortable working and living in settings in which they must adapt to differing values, traditions, assumptions, attitudes and norms that will arise from cross-cultural contact within a new global economy."[23] The Institute has worked to raise MIT's profile in global education in ways that reflect its unique character and boost its capacity to train global leaders, and it has taken steps to provide a competitive and compelling set of international opportunities for students.

The number and variety of international exchanges has increased steadily over the last decade. Several academic departments—aeronautics/astronautics, architecture, and materials science and engineering—have launched small departmental exchanges involving one to three students, most of whom are undergraduates. Partner institutions include Imperial College London, Delft University of Technology, the University of Hong Kong, and Oxford University, and we are adding the University of Pretoria. Besides providing study-abroad opportunities for MIT students, these exchanges bring excellent undergraduates from partner institutions to MIT, to study side by side with our students for a semester each year. Two study-abroad programs in Madrid were also recently started: a semester-long program in which four to nine students participate, and a January program for 20 or more students. The longer program gives students the opportunity to study in Spanish during spring semester. Depending upon their major and interests, students may choose courses at the Universidad Politecnica de Madrid or the Universidad Complutense de Madrid. The January program includes a Spanish course taught in Madrid by an MIT lecturer, along with cultural trips to Spanish cities and visits to companies. To support student participation in international activities, the Global MIT website (http://global.mit.edu/) was launched in 2007. The site provides access to an extensive database of research projects, internships, initiatives, courses, and service opportunities with significant global content.

In 2006, the dean for undergraduate education appointed a faculty-led committee, Global Educational Opportunities at MIT (GEOMIT), to look into ways to enhance undergraduates' opportunities for international experience. GEOMIT recommended expanding the successful models listed above, offering more summer and Independent Activities Period opportunities that are less likely to conflict with course requirements, and removing financial, attitudinal, and academic barriers that may inhibit participation. In addition, GEOMIT proposed integrating global education into the major curricula where possible, and using a holistic approach in which experience is part of a process that helps students build a toolkit for global competency. Arguably the most significant action related to the GEOMIT recommendations has been to establish the Global Education Office, which coordinates and facilitates global-education programs, student participation, and safe student travel. To support these efforts, the Global Education and Career Development Center was formed in 2008 to bring MIT's study-abroad programs, distinguished fellowships, and global-

[23] MIT, *Report of the Task Force on the Undergraduate Educational Commons* (October 2006), p. 11.

education activities together with career-development services. This combination has resulted in one-stop shopping for students and allows them to better evaluate global experiences in the context of future career opportunities.

Another Institute committee formed in 2008, the MIT Global Council, has spent a year analyzing global education and research at MIT. The Council is considering the creation of an undergraduate Global Scholars Program and other opportunities that build on existing efforts in international education and research. In its deliberations, the Council concluded that traditional semesters abroad were, with rare exceptions, problematic in the MIT context. They instead expressed preference for research- and classroom-based preparation for internships and practicums abroad. They also concluded that student activities abroad should be driven and led by faculty in coordination with relevant deans and department heads. The Council will release a report with these and other specific recommendations in fall 2009. Faculty and staff will continue to explore promising programs for adoption or expansion, and ways to address and remove obstacles that may impede efforts to encourage global education at MIT.

One goal for the future will be to identify a set of learning outcomes that cut across MIT's various global programs. Currently, the Global Education and Career Development Center administers an annual survey about students' educational experiences abroad and their plans for careers or further education. Similarly, MISTI measures the impact of its overseas internships by surveying participants before and after and gathering summary reports from the students and the host institutions. However, there has been little analysis comparing the relative impact of various programs to help inform future plans. As MIT works to develop an integrated global-education strategy, such analysis will be needed. A team of representatives from across MIT's programs and offices has started working together on learning outcomes related to global experiences. Their discussions have confirmed that studying or working abroad can have many intangible yet extremely valuable rewards, such as improving students' ability to work successfully on international teams, communicate effectively with colleagues of different cultural backgrounds, and understand cultural differences. Many of these benefits are difficult to measure, however, and one challenge will be to develop appropriate assessment tools.

Leadership

> *We seek to develop in each member of the MIT community the ability and passion to work wisely, creatively, and effectively.*
>
> — MIT mission statement

As President Hockfield stated in her inaugural address, "MIT is uniquely equipped, and obliged, ... to educate the leaders the world needs now."[24] Rather than classify people as "leaders" or "nonleaders" and try to develop individuals into leaders, MIT assumes that everyone can learn and grow in ways that make them more effective in the various contexts, group roles, and processes they take on throughout their lives. Each experience that students engage in during their time at MIT is an opportunity to test skills, strengthen effectiveness, and enhance awareness about the world. Yet, although three-quarters of our alumni tell us that leadership abilities are important or very important to their lives and work, only a small fraction believe they learned these skills at the Institute. Despite the numerous and significant opportunities for leadership development on campus, 9 out of 10 recent graduates say they want MIT to do more.[25]

Over the past decade, the Institute has made great strides in incorporating leadership education into both academic and cocurricular settings:

[24] Susan Hockfield, inaugural address as16th president of MIT, May 6, 2005 (http://web.mit.edu/hockfield/speeches/2005-inaugural-address.html).
[25] Student-led survey and report, "Student Opportunities for Undergraduate Leadership (SOUL)," May 2006.

- Since 2004, the MIT Leadership Center, housed at the Sloan School of Management, has developed research programs and curriculum around the concept of distributed leadership.
- The newly established Alan and Terry Spoon Community Catalyst Leadership program matches juniors with alumni, staff, or faculty coaches to help students develop leadership and networking skills.
- The Chancellor's Office funds a myriad of leadership programs through the Division of Student Life, including the chancellor's summit for student-government leaders, the LBGT (lesbian, bisexual, gay, and transgender) leadership team, and the signature Leadershape program—a six-day program that fosters the development of student leadership skills.

Our goal is to equip graduating students not just with the technical and scientific tools necessary to solve the world's most pressing issues, but also with the relational and collaborative abilities necessary to effectively lead change for the common good.

MIT's Undergraduate Practice Opportunities Program (UPOP), our largest credit-bearing internship program, provides a powerful example of our efforts to achieve this goal. UPOP is a full-year cocurricular program that helps talented sophomores gain the knowledge, skills, and attitudes they need to effectively apply classroom learning to successful careers in engineering leadership, by beginning the process well before graduation. With guidance from MIT faculty, UPOP staff, and industry professionals, students obtain meaningful summer internships in industry, government, and the nonprofit sector. They receive instruction and individual coaching before, during, and after their practicum to help locate and negotiate the terms of summer work and then thrive in the internship. The program served over 300 students in 2008–09 (38 percent of School of Engineering sophomores and 28 percent of the sophomore class as whole). Since the program's inception in 2001, more than 1,250 students have benefited from the combination of top-flight instruction and high-touch support. In surveys, year after year, students indicate that the program makes them better prepared for a summer engineering internships and more appreciative of the multifaceted nature of engineering work. In addition to this positive feedback from the students, 100 percent of the mentor-instructors in 2009 said they enjoyed the experience with UPOP.

The Bernard M. Gordon-MIT Engineering Leadership Program (http://web.mit.edu/gordonelp) represents one of MIT's most recent initiatives in student-leadership development. The program provides leadership-development activities for undergraduate engineers with the broader aim of improving engineering leadership education across the country. Complementing the outstanding academic education students get at MIT, and borrowing some elements of leadership training programs for undergraduates in the Reserve Officers Training Corps (ROTC), the Gordon-MIT ELP provides an array of resources to strengthen leadership capabilities among three groups of engineering students. The program seeks to (1) give all MIT engineering students hands-on visceral experience in project-based learning and results-oriented leadership as part of their normal academic experience; (2) offer advanced courses and multidisciplinary projects to participants in the Gordon Engineers program; and (3) provide focused training to a smaller group—Gordon Engineering Leaders—to prepare them to steer engineering invention, innovation, and implementation efforts. Each group of students has the opportunity to develop leadership skills through project-based learning, extensive interaction with industry leaders and mentors, hands-on product development, and weekly Engineering Leadership Labs.

Over 20 organizations at MIT are involved in leadership-development activities of one form or another. To catalog the myriad options in and outside the classroom, MIT launched the Virtual Leadership Center website (http://studentleader.mit.edu) in 2007. This tool provides one-stop shopping for information about the wide inventory of opportunities and experiences across MIT.

Despite the many programs available, students are increasingly asking for and expecting more systematic and systemic leadership opportunities. MIT must now work with the individual pieces to create a comprehensive, unified framework. To this end, the Division of Student Life will be realigning its organization to include a new position, associate dean for student leadership and activities. In addition, the Institute is in the early

stages of planning a new Leadership Development Network to build on the significant body of work to date, link and leverage the strengths of each effort, and amplify the availability and variety of student leadership-development options. Our goal is to help students understand all they have to offer, learn leadership skills and models, and gain the experiences and feedback necessary to succeed in the future.

Commitment to service

> *We seek to develop in each member of the MIT community the ability and passion to work … for the betterment of humankind.*
>
> — MIT mission statement

From creating new delivery devices for vaccines to developing environmentally sustainable wind-driven pumps for accessing underground water, MIT students find many opportunities to serve the world through their class work and cocurricular learning experiences. Today MIT offers more than 55 outreach programs on campus, in the local community, and in national and international locations, as well as 19 student service groups, eight of which focus on international issues.

The MIT Public Service Center (PSC) spearheads a significant amount of public-service involving 2,500 to 3,000 MIT students, primarily undergraduates, a year. Founded in 1988, the PSC aims to motivate, facilitate, and celebrate the ethics and activities of public service at MIT. Through the Service Learning Initiative, the Community Service Work-Study Program, fellowships, internships, grants, and collaborative initiatives such as International House, the Public Service Center strives to offer MIT students an expanded, experiential education that augments and applies their academic education. A quintessential example is the IDEAS Competition, an innovation and entrepreneurship contest to address the needs of underserved communities around the world. In 2007–08, approximately 300 students participated in IDEAS, with 45 teams submitting initial proposals and 24 teams submitting final entries. Last year's winning inventions included a unique Braille-writing device that enables users to take notes and write for extended periods; a mobility aid that can morph between a standard wheelchair and a long-distance, lever-powered traveler; and a virtual gaming technology that can function as a rehabilitation aid for stroke patients in areas with few health-care professionals. In 2009 the IDEAS Competition partnered with the MicroLoan Foundation to support projects that address the financial needs of small-scale entrepreneurs. The 2008-09 Muhammad Yunus Challenge to Alleviate Poverty, an MIT contest, focused on new technologies to supply the energy-storage needs of the poor.

Service Learning classes integrate academically relevant service projects into the curriculum. This gives students the opportunity to help underserved communities while earning academic credit, applying their education, and working toward their MIT degree. The Service Learning program was founded at MIT in 2001. Since that time, roughly 1,700 MIT students have participated in Service Learning classes in 10 departments. Further information on successful Service Learning experiences may be found at http://web.mit.edu/mitpsc and at http://web.mit.edu/d-lab. The program is poised to grow, given the general interest in project-based learning as well as increasing student interest in service and in the real-world application of academic concepts. To support this growth, the Service Learning program administrator will collaborate with faculty to develop appropriate infrastructure, create a cohort of practitioners, research funding opportunities, provide assessment support, and publicize successes.

Another campus institution with a public-service mission is the Abdul Latif Jameel Poverty Action Lab (J-PAL). This program, established five years ago within the Department of Economics, epitomizes MIT's commitment to applying scientific knowledge to solve global problems and serve humankind. The lab promotes the use of randomized trials, similar to methods used to test experimental drugs and vaccines, to evaluate antipoverty interventions in education, health, women's empowerment, and rural development. Working closely with partners all over the world, J-PAL helps translate research into action, providing evidence to governments, nongovernmental organizations, private companies, and international agencies

about the most successful and cost-effective approaches to reducing poverty. A major gift announced in 2009 will allow J-PAL to expand its work over the next five years and well into the future, with the goal of improving the lives of 100 million people worldwide by 2013.

The MIT Educational Studies Program (ESP) is one of our oldest and largest student organizations committed to service. Founded in 1957, its mission is to create opportunities for students to share their knowledge and creativity with the community in both traditional and non-traditional classroom settings. ESP classes are developed and taught by MIT students, alumni, and faculty, and members of the community and vary from completely fun and non-academic (Duct Tape Design, Bottle Rockets) to the most advanced and challenging (Build Your Own Operating System, Quantum Mechanics). Each year, ESP's educational outreach programs assist thousands of middle and high school students. Splash, its flagship event, has drawn a total of two thousand students to the MIT campus for a weekend of celebrating the joy of learning. From the months of preparation through the final program wrap-up, fully ten percent of the MIT undergraduate population is involved in making Splash possible. Throughout the year, ESP supports its teachers - MIT students - as they conceive, develop, and execute innovative, original courses. The program also contributed to the development of Highlights for High School – a guide to MIT OpenCourseWare subjects selected specifically to help high school students prepare for AP exams, learn more about the skills and concepts learned in high school, and get a glimpse of what they'll soon study in college. The success of ESP's model has led to grass-roots efforts to emulate it at other universities, including Stanford, the University of Chicago, New York University, and the Technion.

To determine how effective MIT's service efforts are, the Institute uses a number of tools and metrics. For example, every PSC program gathers data from key constituents each time the program is run. Methods include pre- and post-surveys, interviews, focus groups, weekly or bimonthly e-mail check-ins, and essays. Each assessment is designed to investigate metrics developed for the particular program outcome. For example, service-learning-class surveys ask students and faculty to assess whether learning objectives are met, competencies developed, attitudes changed, and so forth, while fellowship-program surveys for students and community supervisors focus on matters such as development of self-confidence and leadership skills, community impact, and ways to improve the program's support systems.

The PSC also conducts research in association with other MIT units, such as the Teaching and Learning Laboratory. Some of this work enables MIT to contribute to the literature on service learning. For example, in subject 2.009 (Product Engineering Design), our survey data have demonstrated that the service-learning component in the senior product-design curriculum has a significant positive effect on students' attitudes about careers in mechanical engineering—information that was disseminated in a publication and conference presentations. To continue to strengthen our service programs, the PSC enlisted the help of an MIT human-resources professional and an expert on young-adult development to do a comprehensive literature review about the effects of public service on young-adult development; the report is available in the accreditation team room.

IV. THE ARTS

> *The arts at MIT connect creative minds across disciplines and encourage a lifetime of exploration and self-discovery. They are rooted in experimentation, risk taking, and imaginative problem solving and strengthen MIT's commitment to the aesthetic, human, and social dimensions of research and innovation. The knowledge and creations generated by the arts, exemplary of our motto—*mens et manus*, mind and hand—are an essential part of MIT's effort to build a better society and meet the challenges of the 21st century.*
>
> — Arts@MIT mission statement

A majority of MIT's entering freshmen (75 percent of the class of 2012) have had formal training or achieved documented excellence in the arts in high school, including, music, theater, and visual arts. They

are students in whom technical aptitude and artistic proficiency coexist and inform a new outlook on creativity and innovation. Over half of the undergraduate population enrolls in an arts class before graduation.

Reforms to the HASS curriculum introduced a separate category for arts in 1985, strengthening their prominence in the distribution requirements and initiating the joint administration of arts subjects in the GIRs across the School of Architecture and Planning and the School of Humanities, Arts, and Social Sciences ("Arts" was added to the name of the school in 2000). Following the May 2009 vote of changes in the GIRs discussed earlier in this chapter, three categories will replace the previous five distribution requirements, including one devoted entirely to the arts (music, theater arts, writing, history of art and architecture, and visual studies). Thus every undergraduate will take a subject in the arts; the arts will be "mainstreamed" in the core curriculum for the first time, and all undergraduates will have exposure to world-renowned faculty in architecture, visual arts, media arts, music, theater, dance, and writing. There are thriving graduate programs in architecture, history of art and architecture, media arts and sciences, and visual arts as well.

The practice of art is particularly well suited to MIT's educational and research culture, which advocates learning by doing, encourages students to become cocreators in research and innovation, and has a history of breakthrough accomplishments at the intersection of art and technology. A drive to push the possibilities of representational devices and materials that expand the boundaries of the senses began well before the opening in 1985 of the now internationally renowned Media Lab. Today the search for better expressive and technical tools for storytelling, photography, film, video, computer graphics, and musical composition takes place not only in the Media Lab and in classes primarily concerned with the creative arts, but all over the Institute—from the Department of Brain and Cognitive Sciences to the Computer Science and Artificial Intelligence Laboratory, and from the Program in Writing and Humanistic Studies to the Edgerton Center.

MIT culture has never been animated solely in the classroom or the research lab, and the two premier exhibition spaces on campus, the List Visual Arts Center and the MIT Museum,[26] continue a longstanding tradition of engaging the active learner in object-centered or experiential education. The List Visual Arts Center oversees MIT's public art collection (one of the top 10 university collections in the country), the permanent and student-loan art collections, and ambitious exhibitions of cutting-edge contemporary art that receive national and international attention. The MIT Museum's goal is to make the research and innovation created at the Institute accessible to all. The Museum's architectural, nautical, and hologram holdings rank among the most important in the country. Public engagement through creative educational programming and support of the academic priorities of the Institute are a top priority at both institutions; the Museum's Cambridge Science Festival (the first science festival in North America) and the POST (Public Outreach in Science and Technology) Initiative are prime examples, as is the List's Max Wasserman Forum on Contemporary Art, established to address annually an important and controversial issue in contemporary art.

The 90 or so performing groups in the arts (including 8 that are curricular and professionally directed) embody MIT's recognition that learning the arts, understanding their significance, and perfecting technique take place outside the classroom as well as within. Along with classical European music and Shakespeare, members of the MIT community can enjoy world music and performances by a Balinese gamelan, a Sengalese drumming ensemble, and MITHAS, which features classical dance, theater, and music from South Asia. Electronic music by "hyperinstruments," theatrical pieces using intelligent robots, and dances choreographed with sophisticated sensors and elaborate feedback systems are among the 100-plus productions a year. One of the jewels of the Music Section has been the Emerson Program for Private Instruction, which awards scholarships to the most talented students (selected by audition) for private instrument instruction with local master teachers. A vibrant program of artists-in-residence in architecture, visual arts, music, theater, and dance brings even more artistic excellence to campus; these visits often extend

[26] There are nine other exhibition spaces at MIT: the Compton Gallery, the Dean's Gallery, Hart Nautical Gallery, the MIT Libraries' Maihaugen Gallery, the MIT Museum Architectural Collection, the Outdoor Sculpture Collection, the Jerome B. Wiesner Student Art Gallery, Rotch Library Exhibitions, and the Elliot K. Wolk Gallery.

from or foster collaborations with MIT faculty, a reciprocal component of MIT's outreach to the wider world.

Notwithstanding the many outstanding projects and programs in the arts and the high visibility of the creative arts faculty, the Institute still confront challenges. Programs in the arts at MIT have developed their strengths through creative adaptation to our distinctive culture as a center of innovation in science and engineering and through entrepreneurial endeavors in decentralized contexts. It may now be time for a cultural shift toward greater coordination and aggregation of the artistic communities at MIT, to enable them to flourish in the present cultural moment, which is characterized by unprecedented growth in technologies for producing art, creating music, making moving pictures, and developing other art forms as yet unimagined. Under the direction of the Provost's Office, the Creative Arts Council (an advisory committee of faculty and staff in the arts) is reviewing a draft white paper on the history and future of the arts at MIT. Among the goals are (1) to extend MIT's legacy of inventing the artistic and performative languages of the future, along with the technical innovations that enable them; (2) to create exhibition, performance, and research facilities appropriate for the media-rich art forms of the future; (3) to seize the opportunity of the core-curriculum requirement for the arts; and (4) to design strategies that raise awareness on campus and beyond that MIT is a center of excellence in the arts and nurtures creativity and innovation across many disciplines, most prominently at the intersection of art, science, engineering, and technology.

V. ASSESSING TEACHING AND LEARNING

Across the nation, the emphasis on accountability and measurable effectiveness in undergraduate education has never been greater. Changes in NEASC standards since the last visit point to an increase in accountability, with new and more specific language on what assessment is appropriate for, and expected of, institutions accredited by NEASC. However, the subject of assessment in higher education is fraught with discord. Segments of the higher-education community contend that national standardized testing is the only way to consistently measure the value added by an undergraduate degree, while others insist that standardized testing cannot measure all the benefits of a college education. The discussion is particularly enlightening for institutions like MIT, where students enter college with outstanding academic credentials.

A succinct statement of the broader aims of assessment, particularly for selective institutions, may be found in the Consortium on Financing Higher Education document, "Assessment: A Fundamental Responsibility."[27] Approximately 100 schools have endorsed this statement, and MIT is in close agreement with the principles it articulates. With that as a starting point, MIT uses a variety of direct and indirect assessment tools, described in the following sections.

The Teaching and Learning Laboratory

The MIT Teaching and Learning Laboratory (TLL) provides a comprehensive range of programs and services to improve the quality of instruction at the Institute. TLL collaborates with faculty, instructional staff, and teaching assistants in a variety of settings to enhance classroom instruction and strengthen learning.

Since 2000, TLL has been closely involved in a number of faculty-led initiatives to develop and implement innovative curricula, pedagogy, and educational technology. TLL's associate directors for teaching and learning contribute expertise in research on student learning, assist faculty in formulating learning objectives, and aid them in selecting classroom practices that will foster that learning. TLL associate directors for assessment and evaluation craft research studies that generate data about the effectiveness of those innovations. These assessment studies use mixed-method designs that adhere to standards for educational research. Over 50 such projects in educational innovation have been implemented in this way (see chart 4C).

[27] The statement is available in the accreditation team room and at www.assessmentstatement.org/index_files/Page717.htm.

In each case, faculty, working with TLL staff, have generated learning objectives, and TLL educational researchers have studied the extent to which those objectives have been met. More routinely, then, faculty are beginning to depend on knowledge gained through assessment to make curricular decisions, inform pedagogical change, and determine how well students are learning. For example, an instructor in Mechanics and Materials I, created a "framework" to present, in graphical form, the major concepts in the subject and how they relate to one another. In assessments, students indicated the framework provided a context that greatly facilitated learning and understanding. In direct response to this assessment, faculty in six additional Mechanical Engineering subjects have developed, or are developing, similar frameworks for their subjects.

Chart 4C: TLL Projects, 2000–09

Course Number	Department/Section/Program	Projects
1	Civil and Environmental Engineering	2
2	Mechanical Engineering	10*
3	Materials Science and Engineering	3
5	Chemistry	2*
6	Electrical Engineering and Computer Science	9*
8	Physics	3*
10	Chemical Engineering	1
12	Earth, Atmospheric, and Planetary Sciences	2
16	Aeronautics and Astronautics	1
18	Mathematics	2
20	Biological Engineering	2
21 (all programs)	Anthropology, Foreign Languages and Literatures, History, Literature, Music and Theater Arts, Writing and Humanistic Studies, Humanities	11*
	Other	**Projects**
	Health Sciences and Technology	3
	Resident-Based Advising	1
	Science, Technology, and Society	1
	Undergraduate Research Opportunity Program	1
	Biomatrix	1
	Public Service Center	1
	Concourse	1

*Some studies occurred over multiple semesters but were counted as one study.

Indirect measures of learning outcomes

Currently, MIT gathers a variety of data showing that students gain a great deal from an MIT education. These data include results from undergraduate, graduate, and alumni/ae surveys; graduation rates; and the number of students progressing to advanced degrees. MIT has developed a systematic approach to survey research that includes gathering data on academic and student life experiences. Each department is provided with summaries of their students' responses, details on how their results compare to those of other MIT departments, and, whenever possible, results from similar departments at peer institutions. Peer data are available for research purposes through data-sharing agreements with other highly selective peers and research universities. Selected results from these surveys are included in MIT's Undergraduate E Schedule and are provided throughout our accreditation report.

There are four components to MIT's suite of surveys focusing on undergraduates: an incoming-freshman survey administered before students arrive on campus; an enrolled-student survey that includes all undergraduate students; a biannual senior survey administered in the spring of the senior year; and a survey of undergraduate alumni/ae administered every four or five years to a selected group of classes. As noted earlier, each department receives a customized summary of the responses of their students and alumni/ae. Institutional frequency reports are available to the MIT community and the general public at http://web.mit.edu/ir/surveys/index.html.

Alumni/ae surveys provide MIT with insight into student experiences after graduation, including careers, graduate education, service, and personal well-being. As an academic retrospective, the alumni/ae survey asks graduates what was—and was not—valuable in their MIT education. In our 2009 survey of undergraduate alumni, fully 85 percent of respondents indicated that MIT prepared them "more than adequately" or "very well" for their graduate or professional studies, while 77 percent indicated that MIT prepared them "more than adequately or "very well" for their current career. With regard to specific skills and competencies, respondents felt most well prepared to "think analytically and logically," "acquire new skills and knowledge on [their] own," and "use quantitative tools." "Understand social problems," "maintain a healthy lifestyle," and "read/speak a foreign language" were identified as the areas of weakest preparation.

These measures of learning outcomes play an important role in helping MIT respond to the needs of its students. For example, in 1997 when survey data indicated that our graduates did not feel adequately supported in developing their communications skills as undergraduates. The faculty initiated a multiyear process of collaboration and curricular pilots to launch the new Communication Requirement.

MIT is a member of several consortia that share response-level data from a number of surveys, including a senior survey and an alumni/ae survey. The exchange of these data allows similar institutions to understand how their student experiences compare. These data have helped MIT identify curriculum areas needing improvement. MIT works closely with colleagues at peer institutions to improve and update survey questions. For example, work is under way to refine the categories in several of these surveys to better capture student attributes such as self-directed learning and problem solving. Samples of these surveys and summary reports on the survey responses may be found in the accreditation team room.

For the past several years, MIT has administered a freshman, or first-year, survey. This survey was launched to provide benchmark data for student expectations and first-year accomplishments before any curricular changes were made. MIT anticipates continuing this survey to see how changes in the curriculum impact the student experience in the first year. Part of the motivation for the freshman survey was to test the effectiveness of a series of experimental project-based (PB) subjects in the first year. Separate pull-down sections of the survey asked students how their skills in specific areas changed as a result of taking the PB class. Their answers were then compared to those of their peers who did not take the subject. Data from that survey now inform the curricular design of new hands-on, first-year subjects. We anticipate that any additions to the curriculum can be tested using the same methodologies. Included in these surveys are what Educational Testing Services (ETS) calls "soft skills": teamwork, communication, and problem solving, as well as some questions on self-directed learning, which ETS defines as "engagement."

Direct measures of learning outcomes

Much of the national debate on direct measures of learning outcomes has focused on the use of standardized tests such as the CLA, the MAAP, the CAAP, and the GRE. Various offices at MIT have discussed these instruments and evaluated several of them. The consensus is that none of these instruments adequately measures the content of a basic MIT education.

Fifty-nine percent of MIT undergraduates are enrolled in the School of Engineering, which is accredited by ABET, Inc. ABET already requires the School of Engineering to identify learning objectives for every subject and for department-level curricula, and to provide evidence that those learning objectives are being met. Outside of Engineering, all new or experimental subjects funded by MIT's curriculum-development funds (such as the d'Arbeloff Fund for Excellence in Undergraduate Education) are also required to submit learning objectives and a plan for measuring them.

There are many ways the Institute measures student learning in the disciplines. As might be expected, some faculty believe that grades are the best indicator of student performance, and evidence shows that the MIT faculty take their grading responsibilities very seriously. Section 2.60 of the Rules and Regulations of the Faculty describes the levels of subject competency that letter grades are expected to represent. MIT

periodically reviews the distribution of undergraduate grades to monitor possible grade inflation. The most recent analysis found that the average GPA at MIT has remained the same since 1984.

Beyond grades, there are additional direct measurements. Out of 26 academic departments offering undergraduate major programs, 13 require graduating seniors to complete a thesis, capstone project, internship, or design experience, while two other departments have optional thesis requirements. All of the engineering departments require some type of capstone experience. A large percentage of students participate in the Undergraduate Research Opportunities Program, and many of these students produce publishable articles for peer-reviewed journals. Most departments keep track of the achievements of their students, including publications, presentations at conferences, and external honors and awards. Many of these department-specific activities are summarized in MIT's Undergraduate E Schedule. Copies of selected senior theses and published papers can be found in the accreditation team room.

The role of visiting committees

As outlined in Chapter 2, the MIT Corporation's visiting committees play an important role in the life of academic departments. Undergraduate and graduate education are discussed extensively throughout the visits, and students are invited to meet with committee members. The process typically provides valuable feedback that ultimately strengthens departmental programs. The background materials given to the committee chair include comparative data on selected questions from a number of student surveys. Individual departments often provide more in-depth analysis of these data during committee visits. Because each department has a biannual meeting with its visiting committee, the committee provides good follow-up on prior recommendations. Although issues of space allocation, faculty renewal, and graduate fellowship support are commonly discussed, the highly targeted nature of each visiting committee makes it challenging to draw comparisons or make broad generalizations based on the reports. For specific examples of visiting-committee outcomes, see the attached E Schedule.

Student evaluations of teaching and learning

At the end of each semester, MIT undertakes an evaluation of teaching performance and subjects by asking students to complete surveys. Examples of these evaluations may be found in the accreditation team room. A number of academic units also administer their own evaluations, which ask more specific questions about their course offerings and instructors. These evaluations are used to target teaching problems and to inform faculty tenure and promotion decisions.

The central subject-evaluation process is administered through the Office of the Dean for Undergraduate Education. More than 700 subjects are evaluated each term. MIT is switching from a paper-based process to an online system that will provide consistency of data across departmental units. Customized reports have been developed for departments and individual instructors so that they can see summaries of responses as well as individual, but anonymous, student responses. These reports include not only quantitative data, but also student comments. The migration from paper to electronic reporting is expected to be completed by the end of fiscal year 2010. Thereafter, MIT will be able to conduct more in-depth analysis of survey results. The development of an online subject-evaluation system includes the enhancement of our teaching-activity database. This revamped database will make it easier to perform large-scale analysis of faculty load or class size. The subject-evaluation system is intended to be used for traditionally organized subjects. More information on the project is available at http://web.mit.edu/se-project.

Evaluating long-term success

As we at MIT continue to collect and analyze all the data noted above, we continue to believe that an undergraduate education is vital to preparing students for the future. Rather than simply learning content, MIT students develop useful habits of mind—critical-thinking skills, the ability to evaluate alternative courses of action, resourcefulness, and creativity. These skills are emphasized in much of our curricular innovation since they help students continue to learn throughout their lives. MIT understands that its educational impact on students is measured in decades, not weeks or months. Measuring short-term

achievements, such as mastery of a particular skill or subject, may be easier than measuring lifelong attributes, such as intellectual curiosity. However, alumni/ae surveys and graduates' track records provide evidence of our success in instilling those attributes. Long after they leave MIT, alumni/ae continue to demonstrate—in their graduate careers, professional careers, volunteer activities, and personal lives—"the ability and passion to work wisely, creatively, and effectively for the betterment of humankind."

VI. GRADUATE PROGRAM

Readers of this report may occasionally be unsure whether we are referring to programs and services for undergraduates or for all students. There is an explanation for that. As described in Chapter 3, MIT has a single Institute-wide faculty and no independent graduate schools. Therefore, the faculty governance structure, the visiting-committee system, and the myriad other planning and evaluation systems guide both the undergraduate and graduate programs. Even parts of the university nominally dedicated to undergraduate students, such as the Office of the Dean for Undergraduate Education, often provide services to graduate students.

In March 2008, the chancellor announced an important change in title for a senior officer: the dean for graduate students became the dean for graduate education, and the Graduate Students Office was renamed the Office of the Dean for Graduate Education, or the ODGE. The new titles parallel those for the dean for undergraduate education and the Office of the Dean for Undergraduate Education, and they are consonant with titles in sister institutions.

ODGE is an Institute-wide support and referral office specifically for graduate students and graduate administrators. The office complements the individual departments' administration and advocates broadly for graduate education. The ODGE encompasses the work of the dean's office staff, the International Students Office, and the Graduate Student Council. Together, they foster academic excellence and quality of life for MIT's community of graduate students. In spring 2009, the ODGE released a strategic plan (http://web.mit.edu/odge/about/strategy.html) for improving graduate-student diversity, enhancing the graduate community, and strengthening financial support. These topics are addressed in Chapter 6, "Students."

Degree programs

For more than a century, MIT graduate programs have involved faculty and students working together to extend the boundaries of knowledge. The Institute has traditionally been a national leader in graduate education, with prominent master's and doctoral programs. MIT's top-ranked programs in engineering; chemistry; mathematics; the physical and life sciences; economics; political science; linguistics; science, technology, and society; architecture; media studies; urban studies; and management represent a broad spectrum of excellence in graduate education.

Graduate students may pursue work leading to any of the following degrees: doctor of philosophy (PhD); doctor of science (ScD); engineer's degree; master of science (SM); master of engineering (MEng); master of architecture (MArch); master of business administration (MBA); master in city planning (MCP); and the new master of finance (MFin.). Graduate programs are described in individual department statements that can be found at http://web.mit.edu/catalogue/degre.intro.shtml.

Each graduate student is officially enrolled in a degree program. The programs are not limited, however, to subjects offered in a single department. Subjects and research programs may be chosen from several departments with the approval of the student's faculty advisor to ensure that the overall program is integrated and well balanced with respect to a major field of study. Many of MIT's interdisciplinary labs and centers are described in Chapter 2. Despite the wealth of interest and participation in interdepartmental fields, procedures for admission, registration, and awarding of graduate degrees are departmentally oriented. In

short, every graduate student, including those who are working on interdepartmental programs under the guidance of standing or specially created interdepartmental committees, must have a "home" in some department.

Academic departments exercise a large measure of autonomy over their graduate programs, under general guidelines established for the Institute as a whole. Each department has a departmental committee on graduate students, including one or more graduate registration officers, to administer department and Institute procedures.

There is rigorous program review and assessment of student learning through the visiting-committee process, described in Chapter 2. This process is supported by the ongoing collection of graduate-student surveys—an effort that has been evolving over the past decade. Today MIT surveys each incoming student cohort (master's and doctoral candidates). The data collected from students provide benchmarks for subsequent measures. All doctoral students are surveyed when they graduate, using a compilation of instruments including the Survey of Earned Doctorates, a career-services survey, and a student-satisfaction survey based on a core set of questions developed by AAU (Association of American Universities) schools. Master's students are surveyed as they leave, as part of the Career Office's exit survey. There are multiple goals embedded in the exit survey: understanding graduates' immediate career plans, understanding facts related to their educational experience at MIT (how they were supported, levels of debt, etc.), and ascertaining satisfaction with various aspects of their education and social experience. The results of those surveys are summarized by school and by department and compared with survey results for the rest of MIT. A subset of the graduate-student-satisfaction data is routinely provided to visiting-committee chairs as part of a report on departmental strategic indicators. In particular, issues of advising, program quality, and department environment are studied.

Although MIT awards a number of degrees that do not require a thesis (MBA, MEng, MArch, and MCP), a thesis is required for many of the SM degrees and for the PhD. The thesis and the procedures leading up to it involve a number of steps whereby graduate students are assessed directly on their mastery of the material as well as their ability to do original research. MIT students are expected to publish in peer-reviewed journals and present the results of their research at national and international conferences. Metrics for publication differ by department and are included in the E Series and S Series.

One important measure of the success of graduate education, especially at the doctoral level, is the careers of MIT graduates. As part of the data collection necessitated by the recent National Research Council assessment of research doctoral programs, MIT has become more deliberate in collecting data on graduate alumni. Included in our Graduate S Schedule are data on the placement of the last seven cohorts of doctoral recipients. A substantial number of MIT doctoral recipients continue their academic careers, and others pursue research careers either at nonprofit research institutions or in industry.

Graduate training

MIT's "one school" culture creates an environment where the boundary between undergraduate and graduate work is porous. More often than not, undergraduate students work under the supervision of graduate-student teaching assistants (TAs) and research assistants (RAs). In 2008–09, approximately 650 graduate students held teaching appointments in various schools, with the greatest numbers in the Schools of Engineering and Science. Even more graduate students served RAs, as discussed in the next section.

In 2006, following the recommendations of a report titled *Policies for Strengthening the Professional Development of Teaching Assistants at MIT*,[28] the Institute created a minimal standard of training for teaching assistants, which was to be implemented by individual schools or departments. This effort is monitored and supported by MIT's Teaching and Learning Laboratory. As a result of the policy change, the number of TAs who attended TLL orientations more than quadrupled, rising from 100 students in 2006–07

[28] The report is available at http://web.mit.edu/due/resources/06tap.pdf.

(before the policy went into effect) to 430 students in 2008–09. In addition, TLL has begun two other initiatives to improve the teaching abilities of graduate students. The first is the MIT Graduate Student Teaching Certificate program (http://web.mit.edu/tll/programsservices/ta_certificate/certificate.html). Students are required to attend seven workshops, submit pre- and post-workshop assignments, and participate in a microteaching session. Twenty-seven students completed the program in 2008-09, and another 50 have completed more than half of the requirements. When participants were asked to evaluate the training, 80 percent rated the workshops and microteaching as either "useful" or "very useful." The second TLL initiative is Facilitating Effective Research (FER), a series of workshops to help graduate students develop skills in mentoring undergraduate researchers. To date, over 100 graduate students have attended FER workshops. Last year, 90 percent of the attendees rated the sessions either a 4 or 5 on a 5-point scale.

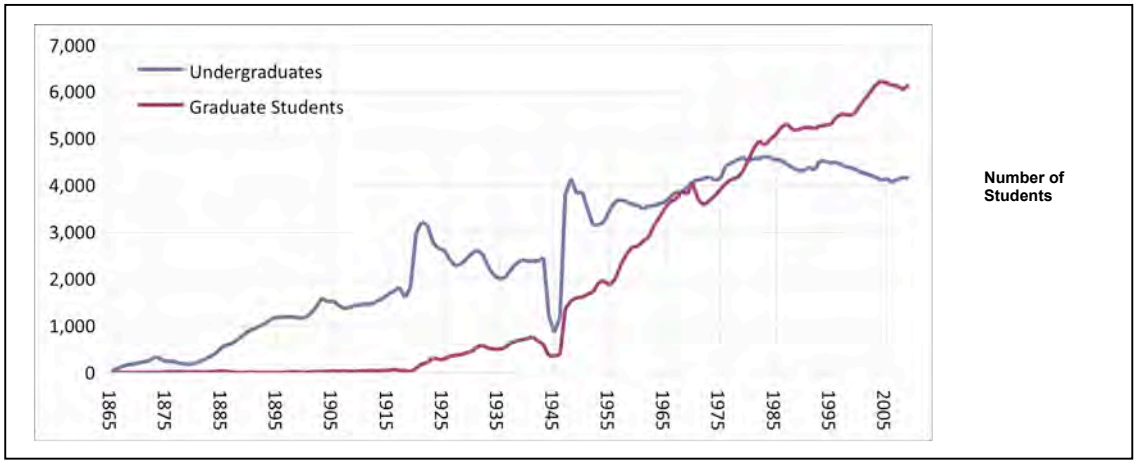
TLL staff members also teach Teaching College-Level Science and Engineering (5.95J), a for-credit subject that focuses on the knowledge and skills necessary for teaching science and engineering in higher education. Thirty-eight graduate students were enrolled in the spring 2009 semester, and five attended as listeners. The Scheller Teacher Education Program (http://education.mit.edu) offers courses for students who wish to teach in grades K–12.

Although the amount of training that TAs receive depends on the departments in which they teach, the increasing emphasis on TA mentoring and advising has led to better educational experiences for undergraduates and, for graduate students, strong preparation for becoming the next generation of the professoriate.

Size of the graduate program

Since the early 1980s, the graduate-student population at MIT has outnumbered the undergraduate population (see Chart 4D). Some of this growth was planned, such as in the Sloan School of Management, which has a deliberate timetable for expanding the size of its MBA class along with its faculty and facilities. However, most of the growth resulted from increases in research funding.

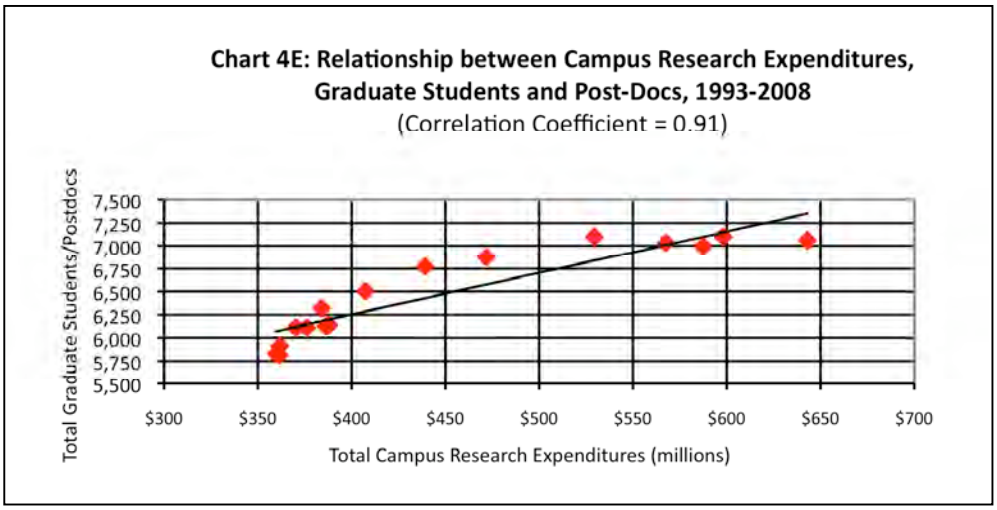
Chart 4D: Growth in Student Population over Time



Research at MIT is driven by faculty interests and is closely linked with graduate education. As Chart 4E reveals, there is a .91 correlation coefficient between campus research expenditures and the total population of graduate students and postdocs. The research enterprise at MIT includes about 1,000 professional research staff, about 2,500 graduate research assistants, and about 1,000 postdoctoral associates and fellows. Our peers have far fewer research assistants (for example, in 2006, Stanford reported 1,658 compared to MIT's 2,500). MIT subsidizes graduate students research by paying 50 percent of the tuition for all graduate

research assistants, rather than charging their full tuition to grants. This has the effect of significantly lowering the cost of research assistants and encourages faculty to support a greater number of graduate students.

The Institute is exploring whether the high number of graduate students we have had over the past five years is in our long-term interest. In particular, enrollment in doctoral engineering programs has grown considerably in the past decade. The Office of the Dean for Graduate Education is engaging departments in discussions about whether a smaller enrollment of better-supported students might be preferable to the status quo, under which large numbers of students are often supported year to year, largely as RAs on research grants. We believe a shift to a somewhat smaller, but better-supported, graduate student body would make MIT even more competitive for the best graduate students. Largely as a result of these discussions, we expect to enroll 1,867 graduate students in 2009–10, a strategic 4.5 percent drop from last year.



Graduate life and learning

There have been important changes affecting graduate life and learning over the past 10 years. These changes signal a new focus on MIT's educational triad of academics, research, and community, and reflect three key themes:

- An evolving social contract that supports enriching student experiences outside the classroom and laboratory. Information on our efforts to strengthen the graduate community through the residential system can be found in Chapter 6, "Students."
- Increased opportunities for acquiring and exercising student leadership. Efforts on this front were covered earlier in this chapter under "Leadership."
- A stronger commitment to overseeing graduate policies and programs through the work of a new standing faculty committee —the Committee on Graduate Programs (CGP)—and the Office of the Dean for Graduate Education.

The Institute established the CGP in academic year 2006–07 to facilitate more deliberate consideration of issues related to graduate education and student life. The committee is charged with several responsibilities: evaluating proposals for new graduate-degree programs and making relevant recommendations to the faculty; considering proposals that would change or modify general policies related to graduate programs and graduate students; encouraging best practices for graduate educational programs; and serving as the standing faculty advisory body to the dean for graduate education and vice president for research, with respect to policies related to graduate students.

The CGP membership consists of six elected faculty members, the associate chair of the faculty, two graduate students, and the dean for graduate education and vice president for research.

The committee's work over the past two years has included:

- Review of new program proposals, such as the new master's in finance in the MIT Sloan School of Management and the interdepartmental Program in Microbiology, both subsequently approved by the faculty
- Review of grading policy, including a proposed new option for pass/D/fail grading designed to encourage graduate students' exploration of subjects outside their main area of research
- Consideration of various innovations, such as replacing the TOEFL test of English proficiency with a more robust test (IELTS), and implementing electronic submission of graduate theses
- Consideration of student-life issues, including research ethics, mental-health services, emergency communications, and efforts to increase the diversity of the graduate population

Looking ahead, the CGP will continue to explore the possible delinking of graduate tuition from undergraduate tuition; continue to promote the IELTS as an alternative to or replacement for TOEFL; and examine the current use of credit conversion for taking graduate-level classes at Harvard, with the possibility of developing and deploying guidelines for its use. The CGP also expects that many recommendations from the Institute-wide Planning Task Force may influence and inform its work in the coming years. For more information about the committee, see http://web.mit.edu/odge/gpp/oversight/cgp.html.

Collaborations and distinctive programs

MIT has launched a small number of distinctive programs in graduate and professional education. One is the System Design and Management (SDM) program, the only degree-granting program at the Institute that can be completed primarily from a remote location. A joint offering of the School of Engineering and the Sloan School of Management, residing within MIT's Engineering Systems Division, the program leads to a master of science degree in engineering and management. The mission of SDM is to educate future technical leaders in architecture, engineering, and the design of complex products and systems, preparing them for careers as the technically grounded senior managers of their enterprises. SDM intends to set the standard for delivering career-compatible professional education using advanced information and communication technologies. The distance option relies on the multipoint synchronous videoconferencing of live classes at MIT; the distance students are virtually present in the classroom through a two-way voice and video link. All students take the same classes, so there are SDM students in the same live classes on campus with the distance students who are virtually present. Since January 1997, a total of 625 students have enrolled in SDM, with employers sponsoring 388 (more than 60 percent). A total of 303 students (48 percent of all enrollees) were in the distance-learning option. In the most recent cohort, which entered in January 2009, 18 out of 61 students (about 30 percent) enrolled in the distance-learning option. Since the inception of the program, there have been 457 graduates, 56 percent of them (257) enrolled in the distance option. The student success rate has been very high: only nine students have failed to complete the program, and only one of these, who completed all his course work but not his thesis, was in the distance program. The distance-learning completion rate is 99.5 percent. A full report on SDM and how it complies with NEASC standards can be found in the accreditation team room.

The Singapore-MIT Alliance (SMA) is another noteworthy program—a collaboration in graduate education between MIT, Nanyang Technological University (NTU), and the National University of Singapore (NUS). The program currently allows students to obtain the following dual (not joint) degrees:

- A master's degree from MIT and a master's degree from either NTU or NUS
- A master's from MIT plus a PhD from either NTU or NUS

The alliance educates young engineers to serve as leaders in a technologically advanced economy, and it creates a cohort of students and faculty with creativity and entrepreneurial spirit. One of the largest interactive distance-education collaboration in the world, SMA takes advantage of state-of-the-art synchronous and asynchronous facilities to achieve seamless instruction across 12 time zones. The voice delay between the classrooms in Cambridge and Singapore is less than a second. The goals and aims of SMA

are threefold: (1) to set a new standard for international collaboration in graduate research and education; (2) to invigorate engineering education in Singapore; and (3) to strengthen MIT through the extension of its global impact, the enhancement of its curriculum, and the improvement of its infrastructure. In September 2009, SMA will commence a new doctoral fellowship program. The program will not offer MIT degrees, but students will receive a PhD from either NUS or NTU, with cosupervision from an MIT faculty member. A full report on SMA and how it complies with NEASC standards can be found in the accreditation team room.

Given the success of SMA, the government of Singapore has recently initiated a dialogue with MIT to seek the Institute's help in developing and implementing the curriculum for a new university. The discussions are in very early stages, but they could eventually lead to vibrant research in the area of design, with new dedicated facilities in both Cambridge and Singapore. As conversations continue, MIT will pay special attention to ensuring that any commitment reconciles the time faculty spend away with their teaching and research on MIT's campus. The SDM and SMA programs were submitted to NEASC in our 2004 interim report, and subsequently approved. MIT was commended "for producing two high quality, well thought out, and strategically targeted distance education programs, the System Design & Management (SDM) program jointly sponsored by the School of Engineering and the Sloan School of Management, and the Singapore-MIT Alliance (SMA). There is significant faculty involvement and control, and the institution works closely with its key constituencies and partners to continuously assess and improve these programs."[29]

In addition to these new programs, MIT has several other long-running collaborations in graduate education. The Harvard-MIT Division of Health Sciences and Technology (HST) brings the Institute together with Harvard Medical School (HMS), Harvard University, the Boston-area teaching hospitals and an assortment of research centers in a unique collaboration that integrates science, medicine, and engineering to solve problems in human health. Over 400 graduate students of science, medicine, engineering and management take their training side by side at HST. This partnership stretches back to 1970, when MIT and HMS agreed to develop a joint program in medical science. Since then, HST has expanded to include doctoral, master's, and training programs. Today these faculty, graduates, and students share a rare "dual citizenship" in medicine and fields ranging from physics, chemistry, and engineering to computer science and business. Graduates earn an SM from MIT, a PhD from MIT or Harvard, and an MD from HMS.

Since 1968 MIT and the Woods Hole Oceanographic Institution have conducted a cooperative academic program leading to graduate degrees in oceanography and oceanographic engineering. These joint degrees are single documents awarded by both institutions. In 2007, NEASC reaccredited the graduate program in its own right.

VII. ADAPTING TO REDUCED RESOURCES

Education is the core activity of MIT, and not surprisingly, we devote a substantial portion of the general Institute budget to supporting it. However, similar to other areas of MIT's operations, many allocation decisions are based on prior history, with changes happening incrementally over time. In today's economic environment, MIT must increasingly approach these decisions from a system-wide perspective informed by data about the cost of providing various types of educational activities. This method will help inform an allocation of resources to best serve students and, simultaneously, fit within the reduced budget in the coming fiscal years. The Educational Working Group of the Institute-wide Planning Task Force undertook a systematic examination of MIT's current educational model; their preliminary recommendations are being finalized as this report nears completion and can be found in Appendix 6. We expect the working group's ideas will require careful study by the faculty and administration to ensure the best interests of both MIT and its students are served.

[29] Letter from the Commission on Institutions of Higher Education of the NEASC, April 28, 2005 (available at http://web.mit.edu/accreditation/archive/2004/letter.html.

Chapter 5: **Faculty**

I. FACULTY APPOINTMENTS
Types of appointments
Hiring, promotion, and tenure policies
Other instructional staff
II. FACULTY RESPONSIBILITIES
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Advising
III. PROFESSIONAL DEVELOPMENT AND RESEARCH ACTIVITIES
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At MIT, a single faculty instructs both undergraduate and graduate students, engages in research activities, participates in the Institute's governance, and provides service to our academic mission. In the 2008–09 academic year, 1,008 faculty held appointments at the Institute. Of these, 997 were full-time and 11 were part-time; 810 were men and 198 were women; and 75 percent were tenured. The Institute is committed to recruiting and supporting faculty of the highest caliber. This is evidenced in part by the numerous awards and recognitions our faculty have earned. Among both active and emeriti faculty, 225 belong to the American Academy of Arts and Sciences, 117 to the National Academy of Sciences, 108 to the National Academy of Engineering, and 34 to the Institute of Medicine. Seven current and six emeritus faculty members are Nobel laureates. One emeritus and sixteen current faculty members won MacArthur Fellowships; seven current and seven emeritus faculty members were awarded the National Medal of Science, one current and one emeritus faculty member earned the National Medal of Technology; and three have garnered the Pulitzer Prize.

I. FACULTY APPOINTMENTS

Types of appointments

Appointments are made at the following ranks: assistant professor, associate professor without tenure, associate professor with tenure, and professor. In the Department of Athletics, Physical Education, and Recreation (DAPER), appointments are made at the ranks of assistant professor/coach, associate professor/coach, and associate professor/senior coach. None of these ranks in DAPER includes tenure, although a few faculty in this department are tenured under former policy. An appointment at the professorial rank carries the expectation of full-time service to the Institute. Part-time appointments are allowed in limited circumstances, including special family situations or retirement-related cases. In rare cases where joint appointments between MIT and another institution are made, the faculty member's obligations to each institution are defined by formal agreement.

Faculty appointments are based in the academic departments, which in turn are grouped into five schools. Most appointments are based in a single department. However, faculty can hold joint or dual appointments in two departments, reflecting MIT's culture of encouraging scholarship that crosses disciplinary boundaries. Faculty holding joint appointments have a primary appointment in one academic department and a secondary affiliation with another department where they may teach, conduct research, or otherwise participate in departmental activities. Faculty holding dual appointments have academic and administrative responsibilities that generally are divided equally and formally between two academic departments. They are accorded all the rights and privileges of faculty membership in both departments, and they are reviewed for promotion and tenure, when applicable, by both departments. Dual appointments may be held at any faculty rank and between any two departments, although dual appointments across schools are rare.

Reflecting MIT's strong tradition of collaboration between departments, in 2008–09 the School of Engineering initiated several faculty searches in interdisciplinary areas including energy, transportation, and computational engineering. In this relatively new model, the faculty search committee included representatives not only from a cross-section of the school's departments, but also colleagues from other MIT schools. The searches commenced without any *a priori* consideration of departmental affiliation for the recruited candidates (who were given the option to choose their home department). The committee's goals were to recruit outstanding faculty in important emerging areas and to promote expanded interdepartmental collaborations among the faculty. These searches have succeeded in identifying the types of candidates that the school hoped to attract, and three of the four searches resulted in job offers, all of which were accepted. As one indicator of the successful ability of this model to break down traditional barriers, all three search committees recommended the candidates to be hired (with input from the candidates themselves) in departments that were not predominantly represented by the composition of the search committee. The Dean of the School of Engineering will likely authorize additional school-wide searches in the coming years, and the apparent success of this strategy may influence other areas of MIT that wish to expand their interdisciplinary approach to faculty recruitment.

Hiring, promotion, and tenure policies

The Institute's practices regarding faculty hiring, promotion, and tenure are based on a commitment to identify the most highly qualified faculty. This serves to advance MIT's mission and to provide mechanisms for a fair and thorough assessment of each individual's qualifications and accomplishments.

All faculty search plans originate within academic departments and require the approval of the relevant school deans. The Faculty Search Committee Handbook (http://web.mit.edu/faculty/reports/FacultySearch.pdf) provides detailed guidelines concerning the search process. All appointments are subject to the affirmative-action serious-search procedures, except in rare cases when the provost may grant an exception for good cause.

Recommendations for reappointment, promotion, and tenure also are initiated in departments. The policies governing these actions are defined and communicated within departments and schools, as well as on MIT's Policies and Procedures website (http://web.mit.edu/policies). New faculty members are provided with information regarding reappointment and promotion schedules, teaching and advising loads, and resources for conducting scholarly research. Each year, department heads are expected to meet with each untenured faculty member within the department to review his or her prospects for reappointment leading to eventual tenure.

Promotion to the successive professorial ranks involves an increasing measure of participation and review by appropriate department-, school-, and Institute-level councils. Decisions take into account both internal and external assessments of the candidate's research accomplishments and professional promise, as well as evaluations of teaching performance and other institutional or professional contributions. The Institute has in place policies that mandate promotion to certain ranks, as well as tenure reviews, based on the faculty member's years of service and age.

Assistant professors are reviewed for reappointment one year before the end of their initial appointment. Each department establishes a process for this review to determine whether the individual's teaching and research accomplishments show sufficient progress, as well as the promise of eventually meeting the standards of tenure, to warrant a reappointment. The department either recommends reappointment to the dean or makes a decision not to offer reappointment, in which case employment ends with the current appointment. All promotions are reviewed at the school level and by a subgroup of the Academic Council.

The tenure review process is vital to ensuring that the faculty has the ability to fulfill the Institute's educational and research missions within a strong culture of academic freedom. When tenure is awarded, the department and school, as well as the Institute as a whole, join in making a career commitment. A single standard of tenure is applied across the Institute: all faculty members awarded tenure must be judged by

distinguished peers to be first-rank scholars who hold promise of sustaining intellectual leadership in their disciplines, through a combination of research, teaching, and service to the Institute and their profession. While adhering to this single standard of excellence, the Institute recognizes that, based on the culture of a particular discipline or the mode of intellectual inquiry, different factors also may be considered evidence of scholarly achievement.

Cases that do not result in promotion or tenure are discussed with the candidate and the dean. The candidate may appeal decisions at the department or school level through prescribed channels. When necessary, a one-year notice of the nonrenewal of an appointment is provided.

In February 2009, a special faculty-led task force was created to review existing policies and practices related to faculty promotion and tenure. This was partly in response to indications from the 2008 MIT Faculty Quality of Life Survey (http://web.mit.edu/ir/surveys/faculty2008.html) that a significant number of faculty may not fully understand the Institute's policies in these areas. This task force is charged with (1) assessing the current procedures leading to promotion and tenure decisions, including mentorship of junior faculty, and (2) making recommendations to strengthen these practices where necessary. The task force also will examine the process by which grievances related to promotion and tenure decisions are addressed. Maximizing the transparency of Institute policies among all faculty will be a primary goal of this effort. The task force expects its deliberations on these issues to last approximately one year.

The continuous benchmarking of faculty salaries by rank and discipline—including the use of data from all 61 members of the Association of American Universities (recorded by the MIT Office of Institutional Research)—informs faculty compensation decisions. In addition, ongoing competition among peer universities to retain the best faculty sometimes provides market-based indicators of faculty quality and, by extension, the success of MIT's academic programs. These data and market forces also help the Institute determine prevailing salary levels by discipline.

Other instructional staff

The Institute appoints several types of nontenure-track instructional staff who complement the efforts of the faculty or meet unfilled or temporary needs. These staff members include lecturers, senior lecturers, adjunct professors, professors of the practice, visiting professors, professors without tenure (retired), instructors, and teaching assistants. The responsibilities and privileges of these appointments are described on MIT's Policies and Procedures website, and some departments and schools have developed local policies regarding appointment terms that fill specific disciplinary needs.

Appointments as adjunct professor, professor of the practice, adjunct associate professor, and associate professor of the practice are limited to 10 percent of the full-time faculty in each department of the School of Architecture and Planning and to 5 percent of the full-time faculty in each department in the other schools. While appointments to other instructional positions are not formally limited by central policy, deans typically monitor the numbers of such appointments to ensure an appropriate balance with the regular faculty appointments in a given department

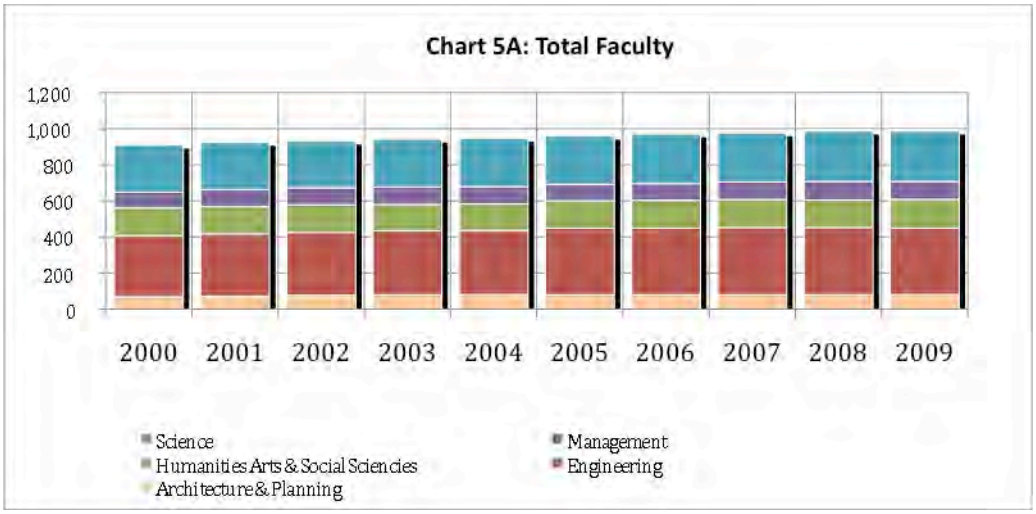
Through the Teaching and Learning Laboratory and the Graduate Student Council programs, graduate teaching assistants (TAs) are trained to improve teaching skills. While TAs serve as classroom and laboratory instructors, test graders, discussion leaders, and tutors, they rarely serve as primary instructors of subjects. TA training efforts are more fully described in the section on the graduate program in Chapter 4.

II. FACULTY RESPONSIBILITIES

The size of MIT's faculty has remained constant for several decades, although it took several years to fully replace 79 faculty who elected to take a retirement incentive offered in 1996. The current ratio of undergraduate students to faculty is approximately 4:1. During 2008–09, 64 percent of classes at MIT

enrolled 20 or fewer students, and the number of classes with enrollments greater than 50 was comparable to the number of large classes at peer institutions.

Distribution of faculty positions among departments reflects the teaching and research demands of the disciplinary areas. To address changing academic demands, deans generally have the authority to reallocate faculty slots among departments within a school. In the School of Engineering and the School of Management, normal policy calls for all unfilled faculty positions to be managed and allocated centrally by the dean's office. On behalf of departments, deans may petition the provost for increases in faculty slot allocations in cases of demonstrated need or special opportunity, although as Chart 5A demonstrates, the distribution of the faculty among schools remains fairly constant.[30] In their meeting with departments, MIT's visiting committees sometimes provide outside input on faculty size.



Generally, faculty duties include teaching, research, departmental and/or institutional service, public service, and contributions to professional organizations. Student advising, at both the undergraduate and the graduate level, forms a substantial part of typical faculty effort and is described in fuller detail below. Faculty workloads can vary in type by discipline. The humanities faculty, for example, tend to teach more subjects but have smaller enrollments than other faculty. In the science and engineering programs, managing the demands of laboratory-based teaching is of the utmost importance.

Faculty have a primary role in designing and monitoring the effectiveness of the Institute's educational program, in part through their participation in standing Institute committees. These include the Committee on Curricula (COC), the Committee on the Undergraduate Program (CUP), and the Committee on the Graduate Program (CGP). The ongoing efforts of these committees are periodically supplemented by the work of special task forces that focus on particular issues of critical and often widespread importance to the educational program. Recommendations from such groups that affect Institute policy are normally brought to the full faculty for review and approval. More information can be found in Chapters 3 and 4.

Support for teaching

As discussed in Chapter 4, the MIT Teaching and Learning Laboratory (TLL) offers the MIT community a comprehensive range of programs and services to improve the quality of instruction and, thus, student learning at the Institute. TLL staff members consult with faculty, administrators, and students on many topics, including the use of different teaching methodologies (e.g., lecturing, discussion teaching, active

[30] In addition to the faculty shown in the chart, there are six housed within the Harvard-MIT Division of Health Sciences and technology.

learning); the improvement of student learning; and the design of assessment studies. Consultations can be as short as one meeting, but TLL staff have also engaged in multiyear, faculty-led initiatives. For example, TLL directed an 18-month collaboration with Cambridge University called the Teaching for Learning Network. This project involved over 20 MIT faculty from six departments. When participants were surveyed about their experience with TLL, they strongly agreed that "identify learning objectives was helpful" and "working with an educationalist was helpful." TLL also offers a teaching orientation for new faculty, a series of lunchtime seminars during the January Independent Activity Period called Better Teaching @ MIT, and department-based workshops on teaching and learning. Chart 5B shows how many faculty members and staff TLL have worked with since 2000.

Chart 5B: Number of Faculty, and Administrators Served by TLL, 2000-09

Client	Extended Engagement*	Shorter Engagement***
School of Architecture faculty	1	1
School of Engineering faculty	40	15
School of Humanities, Arts, and Social Sciences faculty	22	9
Sloan School of Management faculty	†	1
School of Science faculty	12	6
Administrative staff	11	13
Subtotal	**86**	**45**
Total number of faculty and administrators = 131		

*"Extended engagement" indicates that the project on which TLL collaborated was at least one semester long. In some cases, TLL-faculty collaborations have continued over several years.
**"Shorter engagement" indicates TLL staff member had between two and six meetings stretching over a period of several weeks.
† The Sloan School of Management has its own educational developer.

Since 2000, TLL has been closely involved in a number of faculty-led initiatives to develop and implement innovative curricula, pedagogy, and educational technology. Over 50 such projects in educational innovation have been implemented in this way at the Institute. Chapter 4 provides a fuller description of MIT's work in curricular development, assessment, and educational innovation.

Faculty members are encouraged to develop innovative or experimental teaching methods aimed at improving educational quality. To help support such innovations, several recurring programs offer financial resources to faculty (notably, the d'Arbeloff Fund for Excellence in Education, described in Chapter 4, and the Class of 1960 Endowment for Innovation in Education). In addition, the MacVicar Faculty Fellows Program, now in its 18th year, recognizes sustained contributions to undergraduate teaching. The fellowships provide an annual scholar's allowance to assist each fellow in developing ways to enrich the undergraduate learning experience. MacVicar Faculty Fellows serve 10-year terms, and each spring they are honored at MacVicar Day – MIT's annual recognition of undergraduate education.

MIT's Office of Educational Innovation and Technology (OEIT) is a further resource for faculty. As noted in Chapter 4, the office engages in exploratory activities to identify technology-based solutions for new modes of collaboration, production, and the sustainable delivery of educational resources and experiences. OEIT not only acts as a conduit to communicate the availability of educational innovations more widely to faculty, but also facilitates the adoption of these innovations, to help improve teaching and learning at MIT. OEIT's work over the past two years has involved 120 faculty and 110 courses and is described in Chapter 7.

To aid in assessing the effectiveness of instruction, the Institute regularly collects undergraduate students' evaluations of faculty teaching. A current pilot of online subject evaluations, described in Chapter 4, is intended to allow greater ease and flexibility in charting teacher development over time in different subjects and types of classes. In addition, the faculty promotion and tenure process typically includes an assessment of the candidate's teaching and advising effectiveness, informed in part by peer observation of classroom performance.

Advising

MIT sees advising as a critical component of a student's education. We provide numerous venues for students to get both specific topical advice and more general guidance to help them become contributing members of society. The academic environment is challenging for undergraduates and graduate students alike, and advising must provide accurate information about the Institute, its expectations, and its resources if each student is to make wise decisions. Advising must be nurturing and still direct, offering students clear choices as they make their way through the Institute. MIT has Institute-wide services and offices that provide professional advising and counseling (primarily described in Chapter 6, "Students"), while faculty offer guidance on academics and post-college options. In combination, these two levels and types of advising help students make good course selections as well as good life choices.

Undergraduate advising

MIT recognizes that the transition from high school to university life is a potentially stressful and challenging step for all undergraduates on their journey to personal independence and adulthood. Therefore, MIT places particular emphasis on resources and support for first-year students. The Office of Undergraduate Advising and Academic Programming (UAAP) functions as the academic department for first-year students. This office manages the freshman advising system, academic support programming, and study sessions, and it coordinates the first-year instructors with respect to scheduling and support.

Approximately half of first-year students participate in freshman advising seminars, whose leaders serve as their academic advisors. The more than 60 advising seminars offered each year cover a wide range of topics, from Exploring the Arts at MIT to Case Studies in Forensic Metallurgy. MIT encourages first-year students to keep an open mind when selecting a seminar, and not base their choice simply on expected major. Whether or not they join an advising seminar, all freshmen work with a faculty or staff advisor and an upperclass-student associate advisor, who together help them design an effective program of study. Freshman advisors are developed through an ongoing educational program.

Freshmen typically declare a major at the end of the first year or in the fall of their sophomore year. The UAAP and departments sponsor exploration programming in the late fall, during the January Independent Activities Period, and into the spring (with departmental open houses). A sophomore transition program includes discussions related to joining a department, communicating with faculty, and identifying mentors and mentoring relationships, as well as the responsibilities of developing a successful advising relationship.

Once a student selects a major field of study, upperclass advising and mentoring is addressed at the department level. Each department has a process that is managed or coordinated by an undergraduate administrator or academic officer. With slight variations, each department communicates with its new and current students and faculty advisors, and engages them throughout the year with activities and honor societies. In addition, departments have modest resources to hire tutors for upperclass students. They may also encourage students to contact the Tutorial Services Room (TSR) for free, private tutoring; the TSR is an institutional resource available to all students at no charge.

Since the last accreditation visit, new online sites have been designed to help students and their advisors navigate the undergraduate program more effectively. The U-Info site (http://web.mit.edu/uinfo) gives an overview of undergraduate academic-planning resources, based on input from students and advisors about their needs. The site features comprehensive information on academics, advising and mentoring, research opportunities outside the classroom, and careers. At the same time, it serves as a well-organized portal to more specialized MIT websites and other academic support resources.

MIT believes that faculty advising and mentoring of students is necessary and important to the educational experience. We routinely ask students to provide feedback on their experiences with advising, and we track

broad measurements of advising through surveys that are shared with visiting committees. Recent surveys[31] indicate notable progress in advising, but continuing room for improvement. In 2008, 65 percent of respondents were generally or very satisfied with pre-major advising, compared with 54 percent in 2002. With regard to advising in their major, 71 percent were generally or very satisfied in 2008, up from 61 percent in 2002. When compared with our peers, MIT's rates of satisfaction for advising in the major are about the same, but our students are more satisfied with pre-major advising. The trend upward over time is fairly consistent among institutions.

A best-practices review of undergraduate (major) advising was completed in 2006–07. The review indicated that most departments strive to educate and inform faculty advisors to ensure a good advising experience. However, there were several recommendations for improvement:

- Articulate the value of undergraduate advising and mentoring at the Institute level
- Establish Institute standards that define excellent advising and mentoring
- Design and implement a system that tracks and accounts for service to the educational commons
- Develop incentives for departments to reward and recognize faculty for service
- Encourage each department to develop a formal policy that sets a minimum standard for the number of advising meetings per term

In response to the survey, the Institute has already taken a number of steps. In 2008, the Earll M. Murman Award for Excellence in Undergraduate Advising was established to annually recognize and reward a faculty member for outstanding undergraduate advising and mentorship. Four departments have established an associate advisor program modeled after the freshman advising systems, and several departments have initiated a required midterm meeting with advisors. In addition, the UAAP has opened its advisor training programs to upperclass students and begun offering programs more relevant to them. Further steps will be taken on a department-by-department basis.

The Institute seeks to strengthen its undergraduate advising efforts by continuing its move toward an integrated approach to student life and learning. For example, members of the faculty live in most undergraduate halls and graduate residences, where they play a range of advising and counseling roles. Our increasingly holistic approach is explored in Chapter 6, "Students." As discussed there, the Division of Student Life has engaged a consultant to review and assess advising and support structures and make recommendations for future years.

Graduate advising

Advising for graduate students is handled by departments. Graduate students give feedback both through the biannual visiting-committee process and through regular feedback surveys conducted by MIT's Office of Institutional Research. From those surveys, departmental comparisons are made and shared with the provost, the school deans, and department heads. Some of this data can be found in the E and S Schedules and in the accreditation team room. Data from exit surveys of doctoral students over the past three years indicate that although 75–82 percent rated overall program quality as excellent or very good, only 44–51 percent rated the quality of academic advising and guidance as excellent or very good, and only 49–58 percent considered the relationship between faculty and graduate students to be excellent or very good

The Academics, Research, and Careers (ARC) Committee, part of the Graduate Student Council, has worked for several years to help improve the quality of graduate advising and alleviate problems in advisor-advisee relationships. During the summer of 2004, the ARC Subcommittee on Better Advising and Research Ethics identified recurring difficulties related to advising, based on anonymous anecdotes from graduate students and some corroboration fom Ombuds Office staff. To implement proactive solutions, the ARC Committee:

- Prepared information on the importance of graduate advising for the orientation handbook for new faculty, and created a handout for first-year graduate students on "How to Find an Advisor"

[31] MIT recently completed a comparison of graduating seniors in 2002, 2004, 2006, and 2008.

- Obtained quantitative data from the graduate-student survey on the quality of graduate advising throughout MIT, presented survey data and focus-group results in a town-hall meeting in February 2006, and made many other presentations to department heads, departmental faculty meetings, and the graduate administrators roundtable
- Coordinated with departmental graduate administrators to prepare a summary of current practices

Despite MIT's many efforts, the 2008 report of the Corporation Joint Committee on Institute Affairs (CJAC) states that "at the graduate level, there is great variability in the advising/mentoring experience. Some departments consistently do a very good job in this area, while in other departments students' experiences vary widely depending on their individual advisor" (p. 6). The CJAC report pointed to the need to promulgate the good practices that are working in various parts of MIT. As one example, the Department of Aeronautics and Astronautics has adapted some of the practices of the Department of Materials Science and Engineering that were highly praised in the ARC report. The Resources for Easing Friction and Stress (REFS) program a further example of a successful department-based advising project that has expanded. Through REFS, graduate students receive mediation training and support their fellow students during times of uncertainty, stress, or conflict, often identifying concerns at an early stage. These peer advisors act as a conduit for information, make referrals to MIT resources, and warn departments of systemic issues in a way that keeps sources confidential. The REFS model was developed in 2002–03 in the Department of Chemistry; five more departments/centers have since adopted it with plans to expand it to three or four more. Although there has not been a systematic analysis to date, anecdotal evidence suggests the program works well.

To facilitate more such changes, the Graduate Student Council will establish a Task Force on Advising that will develop an updated survey on advising. The survey, planned for August 2009, will be administered in collaboration with the Office of the Dean for Graduate Education and the Office of Institutional Research.

III. PROFESSIONAL DEVELOPMENT AND RESEARCH ACTIVITIES

MIT has historically viewed teaching and research as inseparable parts of its academic mission. Therefore, the Institute recognizes its obligation to encourage faculty to pursue research activities that hold the greatest promise for intellectual advancement. MIT maintains one of the most vigorous programs of research of any university (see Chart 5C). [32]

Research activities range from individual projects to large-scale, collaborative, and sometimes international endeavors. These activities are integrated into MIT's educational mission and are described in Chapters 2 and 4. Peer-reviewed research accomplishments form a basis for reviewing the qualifications of prospective faculty appointees and for evaluations related to promotion and tenure decisions.

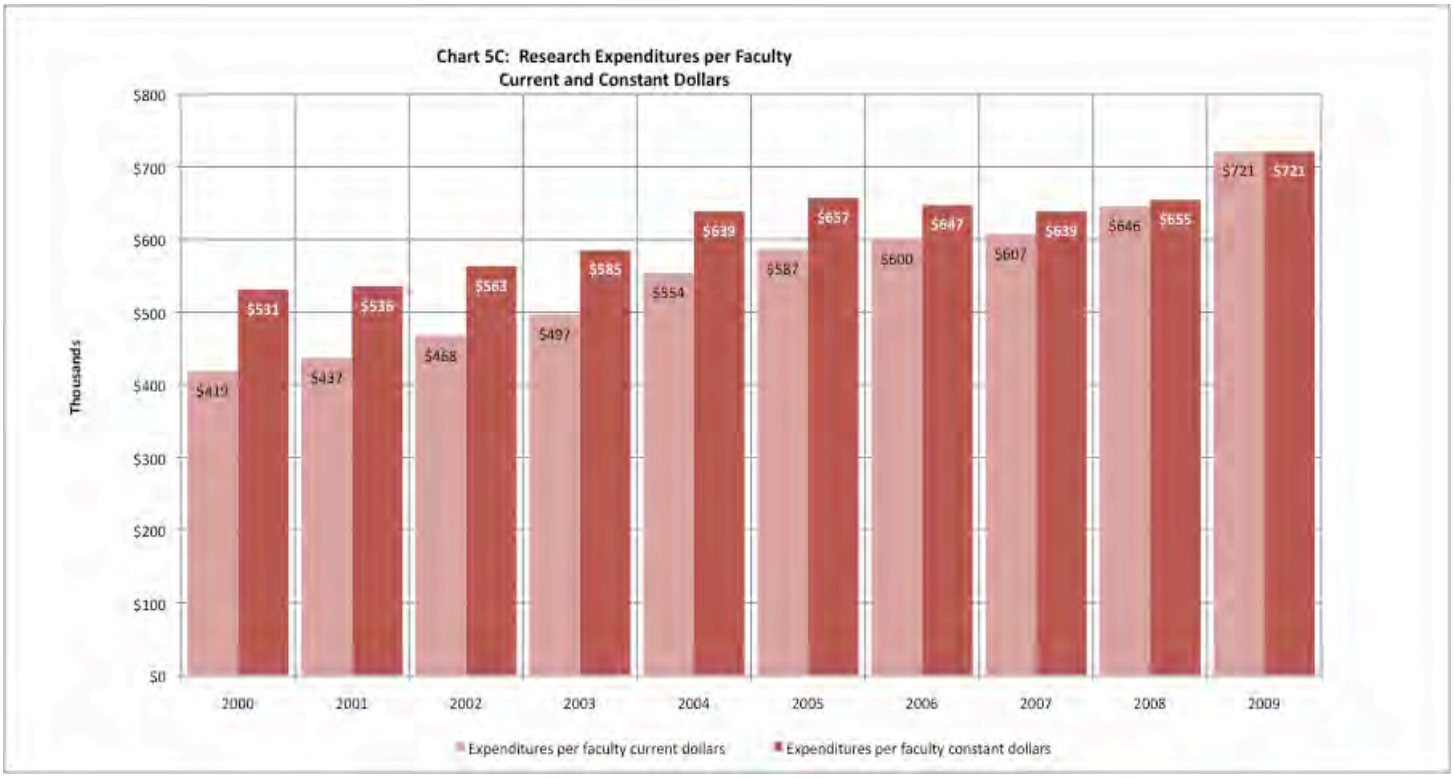
The Institute provides the faculty with the infrastructure and support necessary to conduct research, much of it through contracts, grants, and other arrangements with government, industry, and foundations. The Office of Sponsored Programs provides central support related to the administration of sponsored research programs, and it assists faculty, other principal investigators, and their local administrators in managing and identifying resources for individual sponsored projects. In addition, a Research Council—which is chaired by the vice president for research and associate provost and composed of the heads of all major research laboratories and centers —addresses research policy and administration issues. The Resource Development Office also works with faculty to generate proposals for foundation or other private support.

The Institute allows the faculty to devote an average of one day per week during the academic year to outside professional activities, such as consulting, which may be paid or unpaid. Faculty report their outside

[32] Excluding faculty from the Department of Athletics, Physical Education, and Recreation.

professional activities annually through their department heads and deans. Procedures are in place to examine any activities that may appear to conflict with the faculty's primary obligations to the Institute.

Given the complexity of modern research and the volume of MIT's research activity, in 2008 the provost appointed two faculty-led committees—the Committee on Managing Potential Conflicts of Interest in Research and the Committee on Technology Transfer in the 21st Century—to review and recommend improvements to the Institute's policies. Their work is ongoing and described more fully in Chapter 11, "Integrity."



Leave policies

Sabbatical leaves are intended to enable a period of focused research or study. Following six years of full-time service, tenured faculty members are eligible for sabbatical leaves of either a full academic year at half-salary, or a half-year at full salary. Faculty members must apply to their department heads a reasonable time in advance and present proposals for the use of their leave. In considering whether to recommend a sabbatical request to the dean, department heads must take into account the commitments for teaching, research, and student advising in their departments. The final allocation of sabbaticals is made by the provost.

All untenured faculty are entitled to a junior-faculty research leave. This consists of a one-semester leave with pay, to enable concentrated research effort devoted to career advancement. The leave must be taken within years two through six of the probationary period, and it does not stop the tenure clock.

Faculty members also may request professional and personal leaves. Professional leaves allow faculty members to undertake professional-development or public-service opportunities; they typically are included in calculating years of service for tenure decisions. Personal leaves allow faculty time to address urgent medical, personal, or family matters that prevent full attention to academic and scholarly duties. Personal

leaves are generally not included in the determination of years of service before tenure. Leaves are granted by department heads with the approval of the dean.

Faculty members, regardless of gender, who wish to care for a newborn child, a newly adopted child, or a new foster child may be released from teaching and administrative duties for one semester at full pay. However, they are expected to fulfill their thesis-advising responsibilities and sustain their research programs. In recognition of the effects that pregnancy and childbirth can have on a woman's ability to perform all the tasks necessary to achieve tenure, a woman who bears a child during her tenure probationary period has that period automatically extended by one year. Upon request, the provost may grant a second one-year extension for the birth of an additional child. In all cases, two years is the maximum extension allowed by this policy. As in all tenure cases, a tenure review may take place before the end of the probationary period; that possibility is assessed annually.

Traditionally, tenured faculty members, regardless of gender, who need time for family care (of children, partners, or elders) may request a reduced-time (but not below half-time), reduced-pay appointment for one or more semesters for up to five years, with possible renewal. Details of the arrangement require the consent of the department head and the approval of the dean of the school.

IV. FACULTY DIVERSITY

MIT is committed to attracting more women and underrepresented minority (URM) faculty and to improving their career-development opportunities and quality of professional life. In the 2008–09 academic year, the faculty included 35 African Americans (25 men and 10 women), 29 Hispanics (27 men and 2 women), and 3 Native Americans (2 men and1 woman). Asian American faculty numbered 125 (97men and 28 women); however, Asian Americans are not considered a URM group.

The Office of the Provost began a program in 1991 to provide both resources and new faculty slots to encourage the hiring of women and URM faculty. The program (the details of which are provided in the accreditation team room) has proven effective over the last decade. From fall 1999 through spring 2009, 186 faculty were hired under this initiative (133 women and 82 minority faculty, with some overlap between the two categories).

The provost reports annually to the faculty on recruitment and retention of URM faculty, as mandated by a 2004 faculty resolution that set a goal of doubling the percentage of URM faculty at MIT by 2014. In nearly every year since 2004, the Institute has hired both underrepresented minorities and women faculty at percentages higher than those of its current population of faculty in each group. The percentage of URM faculty increased from 4.5 percent in 2004 to 6.2 percent in 2008–09, indicating that the Institute is reasonably on track to meet its goal of 9 percent by 2014.

In 2007, the provost established the Initiative on Faculty Race and Diversity ("the Race Initiative") to conduct a rigorous study of how race affects the recruitment, retention, professional development, and institutional experiences of underrepresented minority faculty at MIT. The Race Initiative is intended to be similar in scope, and in impact, to MIT's earlier studies of gender equity, which began in the School of Science in 1999 and were extended to include all other schools the following year. The Race Initiative team, which is composed of faculty from across the Institute, issued a preliminary report in July 2007 (http://web.mit.edu/provost/reports/RaceInitiative07162007.pdf). The report provided a detailed plan for carrying out the study, along with some early, practical recommendations for aiding minority-faculty recruitment and making academic departments more aware of the career-development needs of junior minority faculty already at MIT. The team has collected quantitative data on key parameters related to minority-faculty appointments and has held a series of faculty forums designed to encourage candid discussions on the impact of race on faculty life at MIT. Goals of the Race Initiative include a final, comprehensive report in fall 2009 that recommends ways for departments, schools, and the Institute as a whole to increase the number of minority faculty recruited, retain current minority faculty, and enhance the

experiences of minority faculty at MIT. Plans for carrying out the recommendations will also be specified, including ways to measure and evaluate the extent to which the implementation succeeds at the various institutional levels.

To address faculty diversity and gender issues at the highest levels of leadership, MIT in 2007 created the Office of the Associate Provost for Faculty Equity. Two faculty members were selected to share this office, and as members of the Academic Council, they coordinate efforts across the Institute related to the recruitment, retention, promotion, and career development of minority and women faculty. The associate provosts for faculty equity focus on strengthening efforts to hire and retain women and URM faculty, working with the school deans and other groups involved with these processes. As a result, the School of Engineering and the School of Science have modified their search procedures with promising results. The School of Science hired four women and one URM among 10 new hires in 2008-09; two more women will be among nine hires joining in 2009-10. The school also has two offers to women outstanding. The School of Engineering hired two URMs among 13 new hires in 2008–09; 16 new faculty are expected to join the school in 2009-10, including one male URM male and eight women. An offer to a ninth woman is pending. In addition, another male URM has accepted a faculty offer with a 2010-11 start date.

The associate provosts for faculty equity also ensure that junior women and URM faculty have teaching schedules, committee loads, and access to laboratory space and equipment that are conducive to long-term success at the Institute. In addition, the associate provosts hold ongoing discussions with groups of URM faculty, particularly junior faculty, in order to develop more effective career support and guidance structures.

The Office of the Associate Provost for Faculty Equity also works closely with the standing Gender Equity Committees that are based in each of the five schools (http://web.mit.edu/gep/about.html#overview). Those committees, which include both male and female senior faculty, were established soon after a landmark analysis of women faculty in MIT's School of Science[33]. The Gender Equity Committees share a common goal of strengthening the institutional processes that promote equity for women faculty as measured by salaries, resources for research, laboratory space, and similar metrics. Each committee focuses its efforts according to the particular culture and concerns of the school it represents.

The Dr. Martin Luther King Jr. Visiting Professor/Scholar Program, established in 1995, continues its mission of increasing the presence of minority scholars on campus and encouraging individuals of any underrepresented group, especially African Americans, to share their scholarly, professional, and teaching achievements with MIT faculty, staff, and students. A 2006 review found that the MLK program was poorly understood and underutilized. The review committee pointed to the absence of a senior point person for the program, too little funding, and too little integration of the program with departmental activities. MIT began to address these issues with the creation of the Office of the Associate Provost for Faculty Equity, which now has oversight and management responsibility for the program. This shift has drawn increased attention and funding to the program. Each year since 2007, it has supported approximately 10 visiting professors and scholars, normally for one or two academic terms. Selection is based on candidates' professional achievements and their potential for significant contribution to the intellectual life at MIT. We will continue to monitor the MLK program's impact, with the goal of developing additional ways to strengthen it.

V. PROJECTIONS

MIT's faculty have considerable responsibilities, ranging from teaching and research to governance and advising. For this reason, we periodically survey the faculty to understand their views of workload, mentoring, the tenure and promotion process, and balance between work and personal/family life. In early 2008, faculty were invited to respond to the Faculty Quality of Life Survey. This survey was an extension of

[33] *A Study on the Status of Women Faculty in Science at MIT*, March 1999. The report is available at http://web.mit.edu/fnl/women/women.html.

the core survey developed by the Association of American Universities Data Exchange. The overall response rate was 69 percent, comparable to that at peer universities. Over 80 percent of responding faculty reported being somewhat or very satisfied with being on the MIT faculty—there was very little change from the last time this question was asked, in 2004. The overall data from the survey indicate that faculty tend to be quite satisfied with their home department and the quality of their students. Full results can be viewed at http://web.mit.edu/ir/surveys/faculty2008.html. For those areas identified as needing additional attention, such as the transparency of tenure and promotion processes and issues of diversity, MIT has appointed faculty-led committees to examine the issues and produce recommendations in the months ahead.

Future directions for the research enterprise are largely faculty-driven. As discussed in Chapter 2, we are increasingly pursuing cross-disciplinary, multi-institutional, and international collaborations. To the extent that faculty spend more time on research and educational activities overseas, departments will increasingly need to monitor the effects on faculty members' teaching and service obligations at the Institute and ensure that campus staffing needs are fulfilled. The MIT administration is developing procedures for addressing these concerns through the work of the International Advisory Committee.

Faculty renewal continues to be a significant issue for MIT. There is broad consensus about the importance of enabling academic departments to undergo continual intellectual renewal through the recruitment of new faculty. Given financial constraints on the growth of the overall faculty, coupled with the absence of a mandatory retirement age, MIT in 2008 introduced a special faculty renewal program designed to ease the transition to retirement. Under this program, which is in effect for three years, faculty who meet certain age criteria may elect to retire with a choice of incentives. The first year of this program has been reasonably successful, with 19 faculty members, or 26 percent of eligible faculty, electing to participate.
In addition, MIT maintains a preretirement option for faculty who wish to reduce their level of effort in the years leading to retirement. Under this option, faculty of a certain age may choose to work at half-time effort for up to five years in return for an agreement to relinquish tenure at the end of this period. The Institute values the contributions to the academic program that many faculty members continue to make after they formally retire. By mutual agreement with their departments, retired faculty may hold part-time, nontenured appointments for the purposes of actively participating in research or instructional programs. Such appointments must be less than half-time and normally may not exceed five years. MIT will monitor the success of these programs and continue to identify the best incentives and methods to ease senior faculty's transition to retirement, thereby providing opportunities for academic departments to recruit junior faculty members into tenure-track positions.

Chapter 6: **Students**

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The goal of MIT's admissions and financial-aid policies and practices is to attract the most intelligent, hopeful, ambitious, and irrepressibly curious students in the world. As one of the nation's few universities to practice need-blind admissions and need-based financial aid that meets the full demonstrated need of every student, we attract undergraduate applicants from the broadest socioeconomic and international backgrounds. From these applicants, MIT seeks students whose academic and personal accomplishments and potential will contribute to an environment of excitement and discovery on campus. Similarly, MIT is committed to attracting a talented and diverse graduate population.

Recognizing that students will need more than a world-class technical education to succeed in the real world, MIT created the Task Force on Student Life and Learning in 1998. Introduced earlier in this report and discussed extensively during the Institute's accreditation visit 10 years ago, this Task Force offered a deep endorsement of the essential MIT triad of academics, research, and community—but offered many suggestions and an important new idea. It challenged MIT to rethink the classroom and laboratory experiences, enrich its extracurricular offerings, and bring them together to create a stronger and better calibrated mix.

What would that require, in practice? Ensuring that undergraduates encounter professors not only on the far side of a lectern, but also across the dinner table or the squash court. Developing fresh strategies for collaborative hands-on learning not just inside the classroom, but outside it as well. Creating a campus that

fosters those invaluable, unpredictable encounters—with classmates, dorm-mates, teammates, mentors of every age—that can electrify the minds of students. In 2000, the Division of Student Life (DSL) was established to oversee the quality of these experiences. Along with the Institute's research and teaching programs, the DSL equally shares the responsibility of ensuring the excellence and coherence of the entire MIT education experience. Since the release of the Student Life and Learning report in 1998 and the creation of this new division, the programs and services provided to students have improved and flourished.

This chapter begins with an overview of MIT's efforts to attract and retain outstanding students, and to increase diversity at all levels of the student pipeline. We then focus on our many efforts to enrich the student life and learning experience through the work of the Division of Student Life and other offices.

I. ADMISSIONS AND FINANCIAL AID

Undergraduate

Admissions

The mission of the Admissions Office is: to attract undergraduate applicants from the broadest socioeconomic and international backgrounds whose academic and personal accomplishments and potential meet the expectations of the faculty; and to convey an authentic image of MIT to prospective applicants. Each year, MIT Admissions identifies and recruits a class composed of the brightest, most energetic, and most indefatigably curious students in the world. To provide a true sense of the unusual—even quirky—environment that is MIT, the office pioneered an admissions tool that is now widely used across the industry: blogs by admissions officers and students (http://www.mitadmissions.org/). This tool provides prospective students an intense sense of community and an unparalleled inside view of life at the Institute.

Given the importance of finding the right fit, the Institute reviews all applicants on their individual merit and not in comparison to peers from their specific region or high school. This individual approach is a time-intensive process. For entry year 2008, MIT received 13,396 undergraduate applications—an increase of 28 percent from 2005. From these applications, we admitted 12 percent (1,589 students). Of those offered admission, slightly more than 66 percent enrolled. The mean verbal SAT score of those enrolling was 702; the mean mathematics SAT score was 751. Of the entering class, 40 percent were valedictorians and 91 percent ranked in the top 5 percent of their high-school classes; 46 percent were women; and 50 percent were members of minority groups (Asian American, African American, Hispanic, and Native American). The Institute also has made significant progress in enrolling first-generation college students, who make up 18 percent of the class entering in 2008. Although the class for entry-year 2009 is not finalized, the number of applicants rose to 15,661—an increase of 17 percent since 2008—and our admission rate was 10.6 percent, the lowest in our history.

MIT admissions policies and procedures are set and reviewed by the faculty's Committee on Undergraduate Admissions and Financial Aid to ensure that admissions criteria and the selection process match the mission of the Institute. The MIT Nondiscrimination Policy is available on the MIT Admissions website (http://www.mitadmissions.org/policies.shtml).

Recruitment of underrepresented minority undergraduates

The enrollment of underrepresented minorities (African Americans, Hispanics, and Native Americans) has increased significantly in the past few years, from 171 students in the class of 2009 to 257 students in the class of 2012 (25 percent of the class). International students constitute 9 percent of the class and come from 56 countries. Among the United States citizens and permanent residents. 10 percent are African American, 25 percent are Asian American, 14 percent are Hispanic, and 1 percent are Native American. All of these students contribute to the racial, cultural, and ethnic diversity of our community.

A 2007 study by the National Academies titled *Rising Above the Gathering Storm* suggests that inquiry-based learning through research—as early as the middle- and high-school years—is essential to getting promising young scholars interested in science, technology, engineering, and math (STEM).[34] The Academies of Applied Science, through their Junior Science and Humanities Symposium, have for over 30 years embraced this philosophy of inquiry-based education for pre-college students. The Office of Engineering Outreach Programs (OEOP) in MIT's School of Engineering offers four free academic-enrichment programs for middle- and high-school students:

- *MIT Science Technology Engineering and Math (STEM) Program*: The STEM Program runs year-round and serves talented middle-school students from Boston, Cambridge, and Lawrence, MA, who want to explore their interests in science, technology, engineering and math. The program includes a five-week summer institute, a mentoring program during the academic year, and regular seminars for parents.
- *MIT Science of Baseball Program (MSBP)*: MSBP is a four-week summer program aimed at improving the math and science skills of boys entering eighth grade in Boston and Cambridge by building on their interest in baseball. Since 2008, participants have also had the opportunity to participate in an academic-year mentoring program.
- *Minority Introduction to Engineering and Science (MITES)*: MITES is a rigorous six-week residential summer program for promising high-school seniors to study and explore careers in science and engineering. This national program stresses the value and reward of pursuing advanced technical degrees and careers while developing the skills necessary to achieve success in science and engineering.
- *Saturday Engineering Enrichment and Discovery (SEED) Academy*: The Academy is a seven-semester academic-enrichment and career-exploration program for public-high-school freshmen and sophomores from Boston, Cambridge, and Lawrence, MA. The instructional staff develops original curricula that will support students' grasp of the math and science concepts they are being taught in school. Each SEED Academy module focuses on a different technical discipline, from mechanical engineering to robotics to synthetic biology.

OEOP's goal is to provide traditionally underserved students with engaging and challenging curricula in engineering and science. Its core programs foster unique learning experiences for middle- and high-school students and help build a pipeline of diverse and highly qualified scientists and engineers. Since the start of its first program in 1975, OEOP has served 2,200 students through its local and national programs. In 2008–09, 100 percent of the participants in the high-school programs (MITES and SEED Academy) were accepted to college. Approximately 34 percent (600) of the MITES alumni have attended MIT. The SEED Academy graduated 14 students in spring 2009; one of them was the first from the program to be accepted by MIT, and she will be a member of the class of 2013. Alumni of OEOP's middle-school programs (STEM and MSBP) are still in high school, so we do not have data on outcomes yet.

To further build the Institute's admissions pipeline, MIT has a new partnership with Questbridge, a nonprofit organization that connects high-achieving, low-income students to top colleges. In 2008, the first year of this partnership, MIT received 827 applicants from the Questbridge program and admitted more than 80.

A critical component of our undergraduate and graduate diversity efforts is the MIT Office of Minority Education (OME). This office, and its work to support the mission of MIT and offices across the Institute, is highlighted throughout this chapter.

[34] National Academies, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Washington, DC: National Academies Press, 2007).

Recruitment of women undergraduates

MIT's founder, William Barton Rogers, envisioned MIT as a place that would "draw all the lovers of knowledge of both sexes to the halls of the Institute."[35] In 1873, shortly after MIT's opening in 1865, Ellen Swallow Richards became MIT's first woman graduate (and later its first woman instructor). Richards' work testing drinking-water supplies for contaminants made her a preeminent water scientist before her graduation. Later she created the first sanitary engineering laboratory in the United States and helped found the science of ecology. In the past 30 years, MIT has steadily built its number of women students—today, they make up nearly half of the undergraduate student body (45.4 percent in 2008). Of those with a declared major, most (85 percent) choose science or engineering, and they achieve at the highest levels.

Financial aid

For more than four decades, MIT has proudly practiced need-blind admissions. This means that the Institute admits all undergraduates based solely on their academic merit, without considering their ability to pay. MIT stands as one of the few U.S. institutions that continues to be truly need-blind. We meet the full demonstrated need of all admitted students, and we do not award any academic, athletic, or other forms of merit scholarships. If a young person has the talent to get into MIT, the Institute makes sure that he or she can actually attend.

Because science and engineering careers have long been an escalator of social mobility in the United States, MIT educates a high proportion of first-generation college students and low-income students. Among all undergraduates, approximately 17 percent come from families earning less than $45,000 a year, approximately 22 percent come from families earning less than $60,000 annually, and approximately 18 percent come from the first generation in their family to attend college.

For our undergraduate students, the Institute provides grants and loans based on demonstrated financial need, which is determined by analysis of the family's finances. Our commitment to keeping MIT affordable is evident from the following facts:

- The Institute more than doubled its undergraduate need-based grants—from $27 million to $66 million—between 1998 and 2008. Over this period, MIT undergraduate grants grew by more than 9 percent per year. Undergraduates are, on average, paying almost 15 percent less than they paid 10 years ago, after adjusting for inflation.
- The Institute is driving down student debt. Median debt for MIT students at graduation fell 55 percent between 1998 and 2008, from $23,640 to $10,750. The number of seniors graduating with debt has dropped from 702 (67 percent) in 1998 to 511 (51 percent) in 2008.
- MIT matches federal Pell grants. Since 2006–07, the Institute has matched Pell grants to needy students, effectively doubling this federal grant.
- With new financial-aid enhancements, tuition is free for low-income families. Beginning in 2008–09, families earning less than $75,000 a year and having typical assets have all tuition covered by an MIT scholarship, federal and state grants, and/or outside scholarship funds. Nearly 30 percent of MIT students fall into this tuition-free category. For families earning less than $100,000 and having typical assets, MIT has eliminated home equity in determining their need.
- During the past decade, MIT has steadily lowered the amount it expects students to provide through self-help. MIT took a further step in this direction by reducing the work-study expectation for all financial-aid recipients from $5,250 to $4,750 in 2008–09.

Especially in the current economic crisis, MIT remains committed to working with students and their families to make it possible for all undergraduates, regardless of their financial means, to afford an MIT education. For 2009–10, tuition and fees will increase 3.8 percent to $37,782, the smallest increase in eight years; the total undergraduate financial-aid budget will rise more than 10 percent, to $81.6 million. That marks the 10th straight year in which the increase in financial aid has outpaced the increase in tuition.

[35] William Barton Rogers, "A Plan for a Polytechnic School in Boston," March 1846. This document is available at http://libraries.mit.edu/archives/bibliographies/Life&Letters/vol1-appendixC.pdf.

Understanding that college costs present challenges for middle-income families, MIT's financial-aid budget for 2009–10 includes an additional $1.4 million to help families earning more than $75,000 a year. As in the past, MIT will work with students and their families to provide financial assistance that reflects a reasonable assessment of each family's current need, even when a family's economic situation has changed significantly since the student was originally admitted to MIT.

Graduate

Admissions and financial aid

Applicants for graduate degrees are evaluated by the individual departments in which they intend to register. Specific admission requirements vary by department and can be found at http://web.mit.edu/admissions/graduate/requirements/index.html. Admission, registration, and awarding of graduate degrees are departmentally administered. Every graduate-degree candidate must be admitted through one of the 24 graduate departments; in nearly all cases, financial aid is arranged through departments, and the degree or degrees that are earned will be awarded only upon recommendation of the department in which the student is registered. In short, every graduate student, including those who are working on interdepartmental programs under the guidance of standing or specially created interdepartmental committees, must have a "home" in some department.

With increasing competition for the best and brightest students, MIT must act aggressively to ensure appropriate graduate-student support and maintain excellence in graduate programs. Graduate-student funding, particularly fellowship support, is a priority.

MIT's long-term vision for the financial support of graduate students includes:

- Providing each doctoral student with a fellowship (or financial support that is functionally equivalent) for the first year of graduate study. This will allow first-year students to take more coursework and to make well-informed decisions about where and with whom they will carry out their graduate research.
- Guaranteeing funding over multiple years to all doctoral students making good progress, ideally for a period long enough for most students to complete their degree requirements. This funding may be a combination of fellowships, research-assistant positions, and teaching-assistant positions.
- Creating a pool of fellowships for late-stage doctoral students that allows students in their last year to focus all their time and energy on completing their dissertations.
- Providing a forgivable loan program for master-degree and doctoral students who enter public service or work in lower-paying nonprofit positions.
- Expanding the support to graduate students in areas such as dental insurance and child daycare so that all qualified students, regardless of income or family situation, can undertake graduate study.

MIT's fundraising initiative, the Campaign for Students, includes a $100 million goal for graduate fellowships. However, achieving the long-term vision outlined above would require several times that amount over the next decade. As discussed in Chapter 4, the vice chancellor and dean for graduate education is leading a series of dialogues to consider whether the high number of graduate students enrolled over the past five years is in MIT's long-term interest. A somewhat smaller, but better-supported, graduate student body may make the Institute more competitive for the best students. MIT also may also explore its policies requiring full tuition over students' entire graduate education. Many peer institutions charge much-reduced tuition for late-stage doctoral students. While this reduces revenue, it also reduces the costs of graduate research assistants charged to grants. MIT's full vision and strategy for strengthening support for graduate fellowships can be found at http://web.mit.edu/odge/about/financial.html.

Recruitment and support of underrepresented minority graduate students

Approximately 350 students from underrepresented minority (URM) groups are enrolled at MIT as graduate students, comprising about 5 percent of the graduate student body. While this percentage puts us on a par with our peers, it falls short of our aspirations. In 2004, the Faculty Policy Committee resolved, and the

faculty voted, "to take all necessary and sufficient steps to increase the percent of … underrepresented minority graduate students by roughly a factor of three (3) within a decade." This faculty declaration, with the goal of taking a "national leadership role on diversity," builds on a 1998 joint resolution by the Black Graduate Student Association and the Graduate Student Council that urges all academic departments to "place maximum effort and knowledge into recruiting, matriculating, and maintaining the enrollment of underrepresented minority and women students." To meet the 2014 target set by the faculty requires a URM enrollment of approximately 850 graduate students. Although numbers are still preliminary for the class entering in 2009-10, we expect 131 URMs (7.0 percent of enrolling students, up from 6.9 percent last year) to attend MIT.

The Office of the Dean for Graduate Education (ODGE) serves as a catalyst for attracting a more diverse student body into graduate academic programs and for providing all students with support for academic success. The ODGE's strategy is to partner with the Office of Minority Education and academic departments to improve recruiting and mentoring and to develop programs that support diversity at the Institute. As an example, the ODGE works with the dean of the School of Science to provide funding for all incoming URM graduate students for units in the school that do not have enough funds (the office also provides financial support for several URM postdocs in laboratories that cannot otherwise afford them). Another partnership exists between the ODGE and the Department of Biology to select summer research projects for URM undergraduates from institutions across the country. In this program, students from other universities work in various MIT biology labs in a UROP-like experience (UROP, the Undergraduate Research Opportunities Program, is described in Chapter 4). The dean for graduate education also meets with senior faculty in the department to plan coordinated URM recruitment efforts and to align programming where possible.

Approximately 26 percent of admitted URM graduate students have an MIT undergraduate degree. Therefore, MIT has established multiple initiatives to help URM undergraduates succeed and view graduate studies not only as a viable option, but also as a welcoming and inviting career path. For example, in 2006, the Office of Minority Education created the Laureates and Leaders Program. This program prepares cohorts of undergraduate students for graduate study. The program starts at the beginning of the sophomore year with students who have strong academic records and an interest in advanced studies. Over the next three years, participants benefit from faculty mentoring partnerships, developmental workshops, engagement in UROP, financial assistance to participate in conferences, encouragement to make technical presentations, and help with GRE preparation. The first cohort of nine seniors will graduate this year, with at least five of them planning to attend MD/PhD, PhD, or MS graduate programs.

MIT's efforts to recruit graduate students from other institutions include:

- *CONVERGE* : First offered in 2004, CONVERGE began as a grassroots collaboration between the Graduate Student Council, the Black Graduate Students Association, and members of the MIT administration. The program invites a cohort of outstanding underrepresented and underserved undergraduates to the MIT campus for a fall (pre-admission) graduate preview weekend. Since the inception of the program, an average of 27 URMs have participated each year. Three-fourths of all CONVERGE attendees between 2004 and 2008 applied to MIT graduate programs (103 students out of 137). Of those 103 applicants, 27 were admitted and 18 enrolled at the Institute.
- *MIT Summer Research Program (MSRP)*: Since its first summer in 1986, MSRP has worked to increase the pool of African Americans, Mexican Americans, Native Americans, and Puerto Ricans in engineering and science graduate programs. This rigorous 10-week summer research program identifies talented sophomores and juniors from a broad array of backgrounds and from around the country who might benefit from spending a summer on MIT's campus, working in a research laboratory under the guidance of experienced scientists and engineers. More than 90 percent of MSRP participants (to date, over 500 students) go on to pursue advanced degrees. From the cohort of participants in the 2006, 2007, and 2008 summer research programs, 37 students were eligible to apply to MIT (based on graduation year). Twenty-seven applied: six of those applicants were accepted, and four plan to attend MIT in the fall of 2009.

To support graduate students already at MIT, the ODGE sponsors a monthly series of luncheon seminars (the Power Lunch) designed to promote the academic, professional, and personal development of URMs. The series allows students from diverse academic departments to develop supportive peer relationships and share experiences, insights, and strategies for managing the challenges of graduate work.

In response to the 2004 faculty resolution on diversity, the dean for graduate education has created the Recruitment and Retention Council to develop an implementation plan specifically focused on graduate students. The Council, whose members include faculty from each of the five schools, will define desired outcomes for recruiting and retaining underrepresented minorities, and women students as well, and it will report regularly to the provost on these outcomes. To date, the Council has discussed desired outcomes for strategic relationships both with key institutions serving minority students and with women's colleges; this work will engage MIT alumni who are faculty at these institutions and others.

Recruitment and support of women graduate students

In 2008, women represented 31 percent of the graduate student body (1,907 women were enrolled). As with other aspects of graduate education, responsibility for recruiting women graduate students falls to the individual departments, and initiatives vary. The System Design and Management Program has an informal committee that meets periodically to discuss recruitment of women. The Division of Health Sciences and Technology, the Department of Mechanical Engineering, and the Department of Chemistry all have support groups for women that include a recruitment component. The Department of Aeronautics and Astronautics has several programs designed to bring more women into the department at both the student and faculty level, including a new Women in Aerospace Symposium. The Sloan School's MBA program sponsors two half-tuition scholarships (renewable for both years of study) in addition to five to eight smaller scholarships for women each year. Sloan also runs a number of alumni events, networking opportunities, and informal lunches to recruit and support women in its various degree programs. Given the variety of these wide-ranging and individual efforts, there is no centralized assessment data on their comparative impact. However, MIT's population of women graduate students has gradually increased; in 2008–09, almost 33 percent of the entering graduate students were women, up from 27 percent in 1998–99.

The Office of the Dean for Graduate Education has a relatively small staff, but it strives to provide support and coordination to department and school efforts whenever possible. The ODGE primarily focuses on creating an environment that makes MIT an attractive choice for women graduate students. Specific initiatives include:

- *MentorNet*: The ODGE provides the infrastructure and funding for MIT's partnership with MentorNet, a one-on-one e-mentoring program to increase diversity in science and engineering. Since 1998, a total of 307 MIT students, predominantly women graduate students, have been matched with mentors in the STEM fields who work in industry and the academy. In 2007–08, 32 graduate students, postdocs, and junior faculty benefited from mentoring relationships, and 131 graduate students, postdocs, and junior faculty are currently using resources in the MentorNet community. MIT alumni have been avid supporters of the program, and 131 are currently active, many as mentors. In 2003, MentorNet began encouraging academic mentoring, and since that time, 48 graduate students and junior faculty have been matched with faculty mentors. The largest numbers of participants are in the departments of electrical engineering and computer science, biological/biomedical engineering, mechanical engineering, chemistry, and biological science, respectively. Ethnically, 125 Asian Americans, 18 African Americans, 12 Hispanics, and1 Pacific Islander reported using the resources of MentorNet during the 2007–08 academic year. That year, MentorNet chose an MIT graduate student in chemistry for the cover of its annual report.
- *Path of Professorship*: The ODGE offers a weekend workshop for women who are considering a tenure-track position in a science, engineering, or technology field. Now in its third year, the program brought 65 participants to MIT in 2008 (45 graduate students and 20 postdoctoral fellows). Because participants come from different universities and many do not apply for faculty positions

immediately following their participation, we are not able to directly assess hiring trends. However, surveys of participants show high levels of enthusiasm and satisfaction. In 2008, the average grade for the workshop's usefulness was approximately 5 (on a 5-point scale).

- *Events for Minority Women*: In response to requests from minority women at MIT for more networking opportunities with women who have a common cultural experience, the ODGE hosts events to foster community and provide a supportive environment outside of the lab. In 2007–2008, as many as 22 women attended such events, ranging from dinner and conversation to an evening at the theater to pottery painting on a Saturday morning. E-mails, cards of gratitude, connections made across departments and areas of research expertise, and the emergence of friendships and peer-mentoring relationships have all affirmed the value of these events.

Understanding the barriers and contributors to success and satisfaction for graduate women students is critical to MIT's competitive advantage in attracting and graduating the most talented women PhDs of all backgrounds. To that end, the ODGE began focus-group conversations with women graduate students to explore their feelings about the Institute climate, learn what is working well, and hear their recommendations for enhancing their experiences as students and community members. Extensive summaries of the discussions are in hand, and the office expects to broaden the conversations over the next year to include more groups and, ultimately, produce a document that can inform future Institute, department, and program efforts and community standards.

II. RETENTION AND GRADUATION

Undergraduate

MIT admits very talented students who are capable of succeeding in MIT's rigorous academic environment. MIT's high first-year retention rate (98 percent) and six-year graduation rate (94 percent) reflect not only the care taken to admit students who are well matched to MIT's mission and environment, but also the care taken to nurture students during their undergraduate years. An important component of that nurturing is academic advising, which is discussed in Chapter 5, "Faculty," as requested by the NEASC standards of accreditation.

Students' academic performance is evaluated both by their department and by the Committee on Academic Performance (CAP). CAP is responsible for reviewing the academic performance and progress of all undergraduates at the end of each term. Each term, 3.5 to 4.0 percent of MIT's undergraduates are placed on academic warning. In all cases, CAP is responsible for ensuring that the recommended final action is based on the individual circumstances of each student and is consistent across the undergraduate programs at the Institute. Additional information on CAP is available at http://web.mit.edu/acadinfo/cap/index.html.

Each year, approximately 40 undergraduates are required to withdraw because of serious academic difficulties; a required withdrawal (RW) represents a one-year mandatory leave from MIT. Since 2000, 28 percent of RW students have returned to the Institute after the one-year mandatory leave. Some students remain separated from the Institute for a longer period, working and/or matriculating at another institution. Ultimately, nearly 42 percent of all RW students return to MIT.

MIT has an early-warning system for first-year students, called the fifth-week flag, in which instructors identify students at risk of failing a subject. The student is notified by e-mail regarding his or her performance. This e-mail is copied to the senior associate dean and director of undergraduate advising and academic programming, who then offers appropriate assistance to the student. All of the resources available to flagged students are also available and communicated to every MIT student: study sessions for math and science subjects that fulfill the General Institute Requirements; learning-strategy workshops and online modules; tutoring through departments and the Tutorial Services Room; counseling; and medical services. In addition, in 2006 an ad hoc Early Awareness Committee was established to identify incoming freshmen who might benefit from special services to support their academic success during the first year and beyond.

Committee participants include representatives from Admissions, MIT Health Services, and Undergraduate Advising and Academic Programming.

Despite the high academic caliber of MIT's underrepresented minority students, there remain disparities in graduation rates and cumulative grade point averages between URMs and non-URMs. This pattern is consistent with nationwide trends, although the disparities are less severe at MIT than at other institutions. URMs also participate in the Undergraduate Research Opportunities Program at lower rates than their undergraduate peers; however, recent interventions have lowered this gap to 4 percent. As we continue to address our concerns about the pipeline, we need to better understand and remedy factors that contribute to differential outcomes.

In very rare cases, students leave MIT and do not graduate because of some kind of misconduct. MIT takes seriously its commitment to academic honesty, community standards, and personal integrity. These issues are addressed fully in Chapter 11, "Integrity."

Graduate

MIT closely monitors the retention and graduation rates of its graduate students. When preparing the data schedules for our accreditation report, the Office of Institutional Research analyzed several graduate student cohorts and confirmed that retention rates are high. For example, among those entering the School of Science from 1996 to 2001, approximately 90 percent graduated with a masters or doctoral degree (roughly 80 percent earning doctorates). Further information can be found in the Graduate E Schedule. Many of our efforts to support and retain graduate students are described in the advising section of Chapter 5.

III. RESIDENTIAL COMMUNITIES

Undergraduate

MIT aims to build flourishing communities in its 11 undergraduate residences, four cultural houses, the new International House, seven graduate residences, and 38 FSILGs (fraternities, sororities, and independent-living groups). To address this goal, the Office of Residential Life (created in 2007) connects the offices of Housing, Campus Dining, Residential Life Programs, and FSILGs. This new partnership provides a more comprehensive approach to living and learning and offers students opportunities to strengthen their leadership skills and grow intellectually throughout their residential experiences.

MIT guarantees housing for all four undergraduate years. First-year students are required to live on campus in one of MIT's 11 residence halls. After the freshman year, a large number of students choose to move into FSILGs. A small percentage opt for an off-campus apartment, but approximately 95 percent of undergraduates live in MIT (or MIT-approved) housing.

All undergraduate and graduate residence halls have live-in housemasters. Because the residential halls are meant to complement the Institute's educational mission rather than simply provide beds for sleeping, in most cases, the Housemasters are a MIT faculty member and spouse. With the addition of several new, energetic housemasters over the last 10 years, on-campus residential communities are thriving. Housemasters provide leadership, represent the house to the Institute, and oversee residence-based advising and counseling, crisis management, social interactions, governance, and discipline.

The Residential Scholars Program, initiated in 2002 with the opening of Simmons Hall, provides opportunities for visiting faculty and staff to live in residence halls. There they contribute to educational programming, conversation, and richer experiences for the residents. This program has grown and now exists in several residences on campus. The House Fellows Program offers further opportunities for interaction by connecting MIT faculty with residential communities for social and educational activities.

Many of these residential programs arose from the recommendations of the 1998 Task Force on Student Life and Learning, which found that "given the time pressures experienced by both students and faculty members, informal interaction is more likely to occur among faculty members and students who live near one another."[36] The current housing system is highly successful in advancing this agenda.

In addition to getting support from faculty (who serve as FSILG faculty advisors, house fellows and housemasters), students are mentored and advised in their residential communities in other ways. Professional staff serve as residence life associates (RLAs) and assistantdirectors, helping with educational programs, acting as emergency responders, and fostering living and learning in undergraduate residences. Graduate resident tutors (GRTs) who live in the dorms, and resident advisors (RAs) who live in the FSILG communities, serve as mentors to all of the undergraduate living communities. RLAs and GRTs are acting members of MIT's house teams. The purpose of the house team is to develop and support a residential community. Typically, GRTs are assigned to a particular area in a dorm, such as a floor or entry, where they oversee study breaks, community building, and issues-oriented programming. RAs play a similar role in both the informal and formal house management in FSILGs.

Themed living communities have also arisen from a commitment to residential programming. There are five such affinity houses, all located in separate sections of New House, one of the larger residence halls, and all remain an integral part of the larger New House community. While four celebrate distinct cultures, the fifth focuses on global education and leadership.

- Chocolate City was founded in 1975 and thrives today as "a brotherhood of MIT students and alumni who identify with Black culture and share common backgrounds, interests, ethnicities, and/or experiences."
- Spanish House (La Casa Castellana) includes both residential and social members. Their shared goals are to spread knowledge of Latino culture and host cultural events that showcase Hispanic traditions.
- German House is composed of two dozen students who "eat together, play music together, go skiing together, speak German with poor accents together," and sponsor a regular kaffeeklatsch for the larger MIT community.
- French House (La Maison Française) is a community for students who enjoy speaking French, exploring French culture, and cooking.
- iHouse was established in 2005 and linked to specific faculty as a home for students committed to service, international development, and global leadership.

All told, these houses include about 150 students. Each of them has some form of freshman advising, and each has found ways to promote its special culture to the wider MIT community.

MIT Campus Dining works with multiple contractors ranging from small restaurateurs to large contractors to create a diverse program that supports an equally diverse community. Since 2002, on-campus dining options have grown from 11 to 30 service locations. The number of residential dining rooms has doubled from two to four, with a fifth location planned for the new W1 residence hall. Although student satisfaction with dining is lower than our peers, Senior Survey data indicates significant improvement recently, with the percentage of satisfied students rising from 17 percent in 2002, to 39 percent in 2006.

Unlike its peers, MIT does not employ broad-based mandatory meal plans. Seven out of eleven undergraduate residences have significant kitchen facilities where students primarily prepare their own meals. The approximately 27 percent of undergraduates who eat in residential dining operations each night give the House Dining program competitive marks. A spring 2009 survey of House Dining conducted by the Undergraduate Association Dining Chair showed that 72 percent of House Dining patrons rated the food as "good" or "very good," and 78 percent gave service the same ratings. By contrast, only four percent rated food as "poor" or "very poor" and none thought poorly of the service.

[36] MIT, *Report of the Task Force on the Student Life and Learning* (September 1998), p. 44

The current meal plan system at MIT creates several challenges. Even though Campus Dining subsidizes residential dining operations, the voluntary nature of the plan puts the department in direct price competition with students preparing their own meals and with local eating establishments. This value proposition creates an ongoing tension between the students and Campus Dining. In 2007 the Division of Student Life formed The Blue Ribbon Committee on Dining to examine the Dining program. This committee was comprised of students, faculty housemasters and staff members, produced a report (http://web.mit.edu/dining/feedback/blueribbon.html) that included recommendations for meal plan requirements. These recommendations were unpopular with students who perceived a lack of transparency in the process. This led the Undergraduate Association to form a parallel committee of undergraduate students that produced its own report. The Dean for Student Life will take both reports under advisement in the coming months to develop meal plan programs that balance financial and operational sustainability with sound nutrition and community-development over meals.

Fraternities, sororities, and independent living groups (FSILGs)

The FSILG system, which consists of 26 fraternities, six sororities, and six independent living groups, is a highly valued part of the educational life and community of MIT. Its origins date back to 1873, when, shortly after the founding of the Institute, the first fraternity chapter formed. Most recently, with demand for sorority membership growing, the Panhellenic Association colonized a sixth sorority in 2008. The FSILG system emphasizes the integration of leadership, scholarship, citizenship, and service in its programming, curriculum, and governance. Currently, about 45 percent of MIT undergraduates are affiliated with the FSILG community. This community, which commands deep loyalty among its members, has generally thrived and adapted to evolving needs over time.

In the last decade, the FSILGs addressed serious challenges, especially following MIT's 1998 decision that all first-year students must live in campus residence halls. The repercussions from implementing this decision in 2002 were very divisive. A 2004 Alumni Association survey found that in an open-ended comment section, over 22 percent of FSILG alumni cited the independent-living situation as an area of real concern. Then-president Charles Vest responded by appointing an 18-member FSILG task force to explore ways of strengthening the FSILG system and sustaining it for years to come. The group's major recommendations were immediately embraced and have since been largely implemented through the efforts of alumni, FSILG members, and MIT staff from across the Institute. It is fair to say that today the longstanding partnership with the FSILGs has been repaired and these groups—and the independent residences and community they provide for MIT students—are mostly flourishing once again.

An umbrella group of alumni of all active house corporations, called the Association of Independent Living Groups (AILG), has played an essential role in strengthening and developing programs for the FSILG community. It was given the Alumni Association's highest award last year for its cooperative work in establishing an alumni-run safety, licensing, and inspection program, and for establishing a comprehensive, alumni-run accreditation program, which regularly reviews all aspects of FSILG operations. The AILG was also instrumental in establishing an effective purchasing group, the FSILG Cooperative, which is now the third-largest collegiate operation in the nation. The AILG continues to expand its efforts and now represents over 200 active alumni volunteers. Given the success of this model, the Division of Student Life plans to explore additional ways to strategically engage alumni around key student-life issues.

Graduate

Today's graduate students actively seek opportunities to share knowledge and experiences with fellow scholars both within and outside their academic departments. After 10 years of focused effort, a new visibility for graduate issues and concerns has emerged at the Institute. It is no longer unusual to have serious discussions about the graduate student body, their infrastructure and programmatic needs, or how to strike an appropriate balance between student life and learning. Despite this progress, the transformation of graduate

studies from a collection of individual labs and academic programs into a true "community of scholars" is still very much a work in progress.

In the past seven years, three new on-campus graduate residences have enhanced the sense of community. In 2008–09, out of 6,146 graduate students, 3,874 (63 percent) lived off campus and 2,272 (37 percent) lived on campus in seven residences for singles and families.

The expansion of the residential graduate community has led to development of the northwest sector of the campus as the physical center for the graduate community. The new residences feature community spaces that are available for programming by student residents and nonresidents alike. Efforts already under way include a wide range of social programs that draw students together, including those who live off campus.

The Graduate Student Life Grants program, now in its eighth year, funds creative initiatives that enhance the graduate experience. Anyone in the MIT community is welcome to apply for a grant; since 2002, more than 200 proposals have been reviewed and over 100 have been funded. More information can be found at http://mit.edu/odge/community/grants.html.

The Graduate Community Fellows (http://mit.edu/odge/community/gcfellows.html) is a pilot project introduced in academic year 2007–08. This cadre of graduate students works on projects and assignments that enhance the life of the graduate community. Fellows receive a modest stipend, report to a senior staff member in the ODGE, and are assigned to projects in particular areas, such as diversity initiatives, programs for women, and the grants program. These fellows also serve as an important conduit for informing the dean and staff about the graduate experience. We anticipate expanding this program from a pilot of five students to at least 20 in the next year or two. Approximately half of these fellows will work as partners with schools and departments on issues of recruitment and inclusion; the remainder will undertake other projects of interest to graduate students.

The ODGE has established many goals for strengthening graduate-student life and learning in the next few years. These include:

- Coordinating website information about opportunities for students to work, play, study, and learn in areas outside their home department
- Centralizing an information repository on graduate-community resources and how to access them
- Developing criteria for when and how to create institutional support for sustaining successful graduate-student programs
- Developing plans for evaluating community programs
- Launching a survey to understand the needs and interests of graduate-student families in the MIT community

IV. SUPPORTING A DIVERSE COMMUNITY

Many of the student recruitment and retention efforts discussed earlier in this chapter focus on underrepresented minorities and women. However, the Institute understands that diversity spans the whole array of human characteristics that differentiate and shape us, including, but certainly not limited to, race, gender, culture, sexual orientation, disability, socioeconomic background, age, religion, and language.

At MIT, student organizations exist for a multitude of affinity groups and cultural, ethnic, and religious groups (see material in the accreditation team room). These organizations help students connect with others like themselves; they also promote understanding of those who are different. For example, the Latino Cultural Center and the Black Students' Union are resources not only for many of the Latino and Black student groups on campus, but also for non-Latinos and non-Blacks who are interested in learning about those cultures. Other cultural affinity groups have grown out of students' special interests: MIT Bhangra celebrates Punjabi folk dance; the Portuguese Leaders of Tomorrow forges connections with Portuguese industry and promotes educational opportunities for Portuguese students; and members of the China

Development Initiative grapple with issues facing their home country. According to an alumni survey conducted in spring 2009, one-third of recent graduates participated for a year or more in an ethnic or cultural club or organization. When asked whether their undergraduate experience prepared them to relate well to people of different races, nations, and religions, 93 percent answered yes.

The Student Activities Office also sponsors two unique diversity programs. MIT's Multicultural Conference brings together students of different races, ethnicities, genders, religions, nationalities, and sexual orientations to talk honestly and openly about the cultural climate at MIT and to learn from each other's experiences. Dinner with Six Strangers provides a comfortable setting for community members from across campus to share a meal and conversation. Both programs charge participants with cultivating a campus environment that promotes trust and respect beyond mere tolerance.

Other collaborations and support structures for diverse groups abound. Family changing rooms in athletic buildings have met the safety and privacy needs of MIT families and transgender students wishing to use the athletic and recreation facilities. In 2005, the Division of Student Life hired a full-time coordinator for the LBGT (lesbian, bisexual, gay and transgender) program, which has expanded programming and support for LBGT students and worked to integrate with other affinity groups on campus.

Office of Minority Education

As highlighted earlier in this report, the MIT Office of Minority Education (OME) is a critical component of our undergraduate and graduate diversity efforts. The OME, which will be headed by a new director in August 2009, is dedicated to nurturing the talent of underrepresented minorities. Opportunities that await the new director include: more fully engaging MIT faculty, students, and community members in the mission of the OME; making greater use of the office's Student Advisory Council composed of 18 presidents of student groups that primarily serve URM populations; comprehensively assessing OME programs; and leading a set of initiatives to support the academic success of URM students in science, technology, engineering, and math disciplines.

Through the OME, the Institute offers a number of programs to undergraduates to supplement our core advising efforts. For example:

- The Mentor Advocate Partnership (MAP) is a volunteer mentoring program for first-year students. MAP mentors help students build relationships with staff and faculty, monitor their mentees' academic performance and personal well-being, offer encouragement, and provide a proactive support network. MAP is in its third year and has doubled from its original size of 40 mentor/mentee pairs. Feedback from both mentors and mentees indicates that the program is achieving its objectives, and there are plans to expand to 110–120 pairs in the future.
- Interphase is a rigorous seven-week, summer residential program for 80 admitted freshmen who have overcome significant odds to gain admission to MIT. The program, which provides academic enrichment and community building, has never been systematically assessed, but we expect the incoming OME director to make that a priority.

Additional programs and services are described on the OME website at http://web.mit.edu/ome/programs-services/index.html.

International Students Office

In a globally-connected world, MIT graduates will need to be comfortable working and living in settings in which they must adapt to the differing values, traditions, assumptions, attitudes and norms that will arise from cross-cultural contact. Chapter 4 "Academic Program", provided an overview of international research and education experiences. However, the diversity of our campus community also helps students prepare for a world in which knowledge, jobs, and culture will be less contained within national boundaries than even a decade ago. International students make up approximately 9 percent of our undergraduate population (389 students) and 38 percent of our graduate population (2,314 students).

The International Students Office (ISO), though housed in the Office of the Dean for Graduate Education, serves both undergraduates and graduate students. The ISO is responsible for complying with evolving federal immigration requirements and for providing federally required orientation programming. In recent years, the office has been experimenting with new programs and services to support students from other countries. For example, a donation from an alumnus allowed the ISO to begin a series of monthly international teas in the fall 2008. In addition, the dean for graduate education has funded a graduate community fellow charged with exploring opportunities for community building among the international graduate students. In spring 2008, the fellow organized the first "Today's and Tomorrow's Leaders" lunches, bringing together international students from a cross section of nationalities, disciplines, and interests. The positive response to the event suggests an ongoing need for this kind of social programming.

Office of Religious Life

Chaplains serve more than 30 religious and spiritual groups on campus. Whether students are exploring spiritual questions, experiencing a challenging personal time, or wanting to talk about politics, ethics, or service, our 16 chaplains are available to undergraduates and graduate students alike. The Office of Religious Life at MIT also offers students a variety of programs and resources. Last year the annual Chaplain's Seminar topic was "Religion and Election." Other programs include the Technology and Culture Forum, a freshman seminar on the Abrahamic Traditions, an ethics seminar, and the Dalai Lama Center for Ethics and Transformative Values. These organized programs enable students to explore the intersections of faith, science, technology, ethics, and more in the context of today's challenging issues.

In an effort to give a more public face to the chaplaincy and provide additional support to religious life and community values, MIT created the position of chaplain to the Institute in 2007. One of the goals of the Institute chaplain is to build on the recommendations of the Task Force on the Undergraduate Educational Commons to focus on diversity and inclusion. For example, the Addir Fellowship Program brings together fellows from various backgrounds to spend one year learning from each other and exploring the Abrahamic faiths—Christianity, Islam, and Judaism. The Office of Religious Life and the chaplain to the Institute have also worked with the Department of Athletics to begin to offer single-gender swimming times for those whose faith does not permit coed swimming.

V. STUDENT ORGANIZATIONS

MIT students run over 400 student activities—and new ones spring up every year. Among MIT's many groups are some that might be expected: a student newspaper, a debate team, a radio station, Model United Nations, student government (described in Chapter 3), College Democrats, and College Republicans. However, MIT also offers some fairly unusual clubs, such as the Hovercraft Club, the Underwater Hockey Group, Origami Club, and the Laboratory for Chocolate Science. Others include the Science Fiction Society—home to the largest open-stack library of science-fiction books in the world—and the Tech Model Railroad Club, which some credit with writing the world's first video game.

Chapter 4 includes sections about two major areas of student activity: the arts and service.

- MIT has approximately 90 performing groups in the arts (of which eight are curricular and professionally directed). These groups embody our recognition that learning the arts, understanding their significance, and perfecting technique take place outside the classroom as well as within.
- MIT students find many opportunities to serve the world through their class work and cocurricular learning experiences. Today MIT offers more than 55 outreach programs on campus, in the local community, and in national and international locations, as well as 19 service groups, eight of which focus on international issues.

The Association of Student Activities (ASA) is a joint committee of both the Undergraduate Association and the Graduate Student Council. A 10-person ASA Executive Board oversees student group activity and is the governing body of student groups on the MIT campus. More information is available at (http://web.mit.edu/asa/about/). The Executive Board is specifically charged with allocating resources to, arbitrating conflicts among, and advocating on behalf of student groups. For example, the ASA leads a storage and office space review and allocation process for student groups every two years. It also manages the bulletin board assignment process – a feature of the Infinite Corridor that evaluation team members may observe during their visit.

VI. ATHLETICS

The Department of Athletics, Physical Education, and Recreation (DAPER) serves the MIT community by overseeing intercollegiate athletics, physical education, club and intramural sports, and health and fitness programming. The department's mission is to bring students, faculty, and staff together in educational activities that promote healthy lifestyles, enhance a sense of community, foster growth in leadership and teamwork skills, and encourage the pursuit of excellence. With its multitude of offerings designed to meet the needs of community members with varying degrees of skill and commitment, DAPER aims to positively impact the greatest number of participants. Today, approximately 75 percent of undergraduates participate in intramural sports and 25 percent participate in varsity sports. MIT's 2008 senior survey indicated that the vast majority of students were "generally or very satisfied" with intramural athletic opportunities (95 percent), club sports (92 percent), and intercollegiate activities (93 percent).

Physical education

In 2006, the Task Force on the Undergraduate Educational Commons commended the thoughtful, creative, and ongoing efforts to better integrate physical education into the total educational experience of undergraduates. MIT's Physical Education Program (http://mitpe.com/) includes over 60 different class offerings. Eight are posted through OpenCourseWare. In 2007, the program added a health and wellness subject called Upgrade Your Health and Happiness. As described in Chapter 4, all undergraduates must complete four six-week physical education courses and satisfy the swim requirement – completing a swim course or electing to test out – before graduation.

Intramurals and club teams

MIT's club and intramural sports programs are among the most comprehensive in the nation. The Institute sponsors 21 intramural sports, each consisting of leagues competing at various levels, and the club-sports program sponsors 30 teams. While club sports were initially intended for MIT's undergraduate population, nearly 40 percent of all graduate students at MIT compete in club sports today. Although student leaders guide the intramural and club teams, the programs are also open to faculty, staff, and the families of MIT community who are DAPER members. For more information, see
http://web.mit.edu/athletics/www/clubsports/index.html and
http://web.mit.edu/athletics/www/intramurals/index.html.

Varsity athletics and academics

MIT fields 33 varsity athletic teams, including 15 women's teams and three coed teams. The Institute competes as part of the National Collegiate Athletic Association (NCAA) in Division III, which emphasizes a student's academic experience and seeks to optimize the balance between athletics and academics. For student-athletes at MIT, admission standards never waver, no special financial aid incentives are provided, and there are no separate curricula for athletes. As of 2008, MIT had produced 114 Academic All-Americans, the third-largest number in the country for any division and the highest number for Division III. In the past 10 years, 157 students in 14 different sports have been awarded All-America honors. Our coaches, who are integral to the development of our student-athletes, have earned numerous national and regional honors.

MIT announced in April 2009 that eight varsity sports would be eliminated at the end of the 2008–09 academic year, bringing the total from 41 to 33. This reduction is essential to the quality and sustainability not only of the varsity programs that remain, but also of the athletic, recreational, and physical-education programs offered to the entire MIT community. Although the global financial crisis factored heavily in the decision, the viability of carrying so many varsity sports had been a concern even in times of relative financial stability. In 2000, the Department of Athletics, Physical Education, and Recreation organized a committee to develop a strategic plan. That committee and all subsequent visiting committees raised questions about MIT's ability to sustain one of the largest varsity athletic programs in the United States.

In deciding which sports to eliminate, the Institute used a management tool developed in 2003 by a subcommittee of the DAPER Advisory Board consisting of coaches, student athletes, faculty, and administrative staff. The Sport Health and Vitality tool monitors the health of each varsity sport by tracking student interest, coaching turnover, availability of appropriate competition, quality and proximity of practice facilities, and program costs. In 2004 and 2006, the DAPER Visiting Committee of the MIT Corporation reviewed and endorsed the process. Recently, an independent consultant reviewed the operational structure of DAPER, and it too affirmed the soundness of the Health and Vitality process. MIT believes that eliminating sports that do not measure up as healthy and vital is a better option than reducing spending in all sports. It not only helps the athletics department meet its budget mandate, but it supports the core value of excellence in all programming. At this time, assuming the economic climate does not worsen significantly, we do not anticipate any further reductions in our varsity sport offerings.

VII. HEALTH, WELLNESS, AND STUDENT ASSISTANCE

Ethos of wellness

MIT Medical is a complete health-care center serving the health and wellness needs of the entire MIT community. The Center for Health Promotion and Wellness at MIT Medical assists students, faculty, and staff in learning about and making choices for a healthier lifestyle. For the undergraduate community, health-education-program managers focus on training student-life staff and other first responders, engaging students individually and in groups around key health topics, and collaborating with campus stakeholders to foster a healthy MIT environment. Key health topics include suicide prevention, sexual-assault prevention and response, healthy eating, stress management and mindfulness, tobacco treatment, sexual health, and relationships. The Center collaborates with DAPER to run the Upgrade Your Health and Happiness class for P.E. credit. Several student groups partner with Center staff on issues relating to community health. Medlinks is a 140-member peer advocacy group working in residences to reduce barriers to care seeking. MIT-EMS is a 60-person all-student volunteer ambulance service that operates around the clock. The Student Health Advisory Committee advises MIT Medical on student-care issues and policies. Imperfect@mit works to reduce the stigma associated with seeking mental health care. Through the Center, members of the MIT community can also access a variety of resources, including a phone line offering tips on relaxation, brochures such as "How to Cheat Sleep," a lending library, online MP3 downloads of MIT-specific relaxation tracks, and on-site wellness classes.

Ongoing program evaluation is incorporated into the Center's efforts. In spring 2009, MIT surveyed 2,000 students regarding sexual-assault-related issues on campus. The responses (742 in all) are still being analyzed, but the Institute has already identified areas for more concentrated programming. These include addressing attitudes and myths about sexual assault among male students and utilizing the finding that most students would trust the Mental Health Service within MIT Medical if they chose to disclose a sexual assault.

An additional focus this year has been to engage the MIT community in defining the attributes of a healthy student, with the aim of assuring the overall well-being of our student population. Setting health and wellness goals will be important for assessing future needs, which will be done in part through a comprehensive student-health survey. Additionally, the statement of goals is intended to help student groups and staff

departments work together, avoid duplication of effort, and make the most of health-related resources. The Center for Health Promotion and Wellness, in tandem with the Student Health Advisory Committee, the Division of Student Life, and MIT Medical, expects to release the goal statement for public comment in fall 2009. The long-term hope is that by establishing these health and wellness goals and building assessment tools around them, MIT can better monitor and meet students' needs in the coming decade.

Mental health

At the time of our last accreditation, the Institute was rated below our peers in the number and variety of mental-health services it provided. In response, we convened the Mental Health Task Force in November 2000 as a combined initiative of the Undergraduate Association, the MIT Mental Health Service, and the Chancellor's Office. Data were collected from a variety of sources, both at MIT and from other universities. The survey results and accompanying recommendations were presented in a 2001 report (http://web.mit.edu/chancellor/mhtf/).

According to the survey, members of the MIT community most wanted quick appointments, evening hours, increased campus awareness of mental-health offerings, and 24-hour on-site coverage. As a result, staffing at the MIT Mental Health Service was increased to improve access, especially for students, and to shorten wait times. Until 2003, many more students were referred to local community clinicians than were seen on campus. A revision in clinical philosophy changed that practice; most students are now followed within the Mental Health Service. Daily walk in hours were established for immediate consultations, and students, faculty, staff, and parents can now reach a clinician by phone 24/7 for urgent consultations. Evening appointments are offered four days a week, and weekend staffing was changed to include a clinician to provide on-site coverage for persons in crisis.

New individual and group treatments are now offered, including those that can help students develop social skills; identify, understand, and manage emotions; address attentional and learning problems; improve interpersonal relationship; reduce procrastination and test anxiety; and facilitate completion of PhD dissertations. The Mental Health Service also incorporates a special emphasis on cross-cultural competence in its staff-development activities. With these and other enhancements, student utilization has increased. In 1995, only 8 percent of the student body was seen annually on site. That number increased to 16 percent in 2008. Senior surveys about satisfaction with psychological services show a positive trend. Students who were generally or very satisfied with services rose from 47.3 percent in 2002 to 81.1 percent in 2008.

Student Support Services

Student Support Services (S^3) assists undergraduate and graduate students with their personal and academic needs. S^3 provides open access and outreach to MIT's diverse student community. Students facing sensitive problems or coping with a crisis can turn to S^3 for advocacy, support, and referrals to appropriate resources. The office works closely with the Mental Health Service and frequently coordinates with other MIT staff and departments to address an array of student issues, including: personal matters, academic challenges, arranging a leave from MIT, accommodating a change in academic status, and adapting to various challenges that affect student life and academic performance.

S^3 has witnessed a steady annual increase in the number of students using its services, from 20 percent of undergraduates in 2003 to 25 percent in 2008. Senior survey data indicate that more than 50 percent of graduating students have had contact with a dean in S^3 at some time during their four years at MIT. This increase in the use of services mirrors trends found in similar college centers across the country.At MIT, the S^3 deans, often working with student groups, residence halls, academic departments, and administrative offices, have developed innovative programs on mental health, academic issues, racial/cultural/ethnic topics, and women's issues. MIT has significantly increased school-sponsored evening and late-night options for programs that focus on peer safety and health education, including health and wellness services, recreational activities, and entertainment programs. S^3's peer-support hotline, Nightline, provides anonymous and confidential support to anyone who calls.

Community Development and Substance Abuse Center

MIT's Community Development and Substance Abuse (CDSA) Center performs extensive in-house surveys of the student population to assess rates of alcohol consumption and other drug use. As alcohol use among college students continues to rise nationwide, the CDSA at MIT has emerged as a national leader in addressing these issues. Designated as a model program by the U.S. Department of Education in 2004, the CDSA continues to provide innovative programs and services. For the past seven years, all entering first-year students undergo a screening for alcohol and other drugs as part of the BASICS program (Brief Alcohol Screening and Intervention for College Students). This two-session self-check program allows students, some of whom may exhibit high-risk drinking behaviors, to compare their alcohol use with peers. The CDSA has evaluated the effectiveness of BASICS and found that it reduces both the quantity of drinks consumed and the frequency of drinking occasions.

In line with national trends, MIT fraternity and sorority students consume more alcohol than their unaffiliated counterparts at the Institute. Although inappropriate and underage drinking is a less-severe problem at MIT than at many other universities, the CDSA has targeted this subpopulation and has developed two programs, PartySafe and ENTICE, to address their alcohol use. PartySafe, a required program for fraternity men, provides in-depth information about MIT and state policies regarding alcohol, including liabilities, and teaches skills for serving alcohol responsibly and holding safe parties. Once every two years, each fraternity house at MIT is required to complete the ENTICE Program. This involves peer-facilitated discussion of issues that each house faces because of alcohol use. ENTICE facilitators encourage the community to set goals and create strategies for reducing excessive alcohol use in the community.

MIT's peer-safety and health-education efforts include SaveTFP. Sponsored and funded by the CDSA, this student group provides late-night programming every Friday throughout the academic year. Designed to bring in a cross-section of students, programs include video-game tournaments, arts-and-crafts nights, and open-mic nights.

Recent Change

The Division of Student Life has announced a reorganization of several groups that provide direct support to students undergoing medical, mental and/or academic difficulty. All the responsible groups were placed in a new Student Development and Support department, led by the Senior Associate Dean in the Division of Student Life. This department consists of the following areas (1) Student Leadership and Activities, (2) Student Citizenship, (3) Crisis Management, and the newly formed (4) Community Development and Student Support office. The last area, Community Development and Student Support, was formed by a merger of the Student Support Services (S^3) and Community Development and Substance Abuse (CDSA) offices. This move joins the strengths of the advising Deans in S^3 with the assessment and outreach capabilities of the CDSA. The new structure offers a more coordinated and integrated response to student's needs by devoting more resources to proactive and educational outreach, and by emphasizing prevention. MIT faculty and students will continue to rely on the full range of S^3's services while the Division of Student Life becomes better able to promote new, creative ways to support MIT's students and assess the outcomes of these efforts. These changes, some of which are pending review by a task force, were made in July 2009.

Emergencies and the on-call system

MIT maintains an on-call system to respond to emergencies involving students. In collaboration with the MIT Police, MIT Medical, emergency-response personnel, Student Support Services, deans, housemasters, Residential Life Program staff, and others, the on-call system provides immediate response and follow-up for student/campus emergencies and crises. Protocols for this program were formalized in 2002, and the roles of the residential-life staff were clarified. Situations in which the on-call system is implemented include medical and mental-health emergencies, incidents of serious injury or death, and serious physical-facility emergencies affecting students.

Disability Services Office

The Disability Services Office (DSO), which is now part of the Division of Student Life, has experienced an increased rate of use. Accessibility and compliance must be considered in the construction and renovation of physical spaces and in the implementation of electronic learning tools. Given the prominence of this theme, the Institute will closely monitor the reauthorization of the Americans with Disabilities Act and will respond appropriately.

VIII. PROJECTIONS

In 1998, the Task Force on Student Life and Learning challenged MIT to create an integrated educational triad—academics, research, and community—worthy of MIT's reputation as one of the world's leading educational institutions. This watershed moment brought new emphasis to the importance of both formal and informal education. Much of the work to support and improve the lives of MIT students for the last decade has been guided by the Task Force recommendations. As described earlier in this report, in 2008–09 the Corporation Joint Advisory Committee (CJAC) on Institute-Wide Affairs, composed of faculty, trustees, and graduate and undergraduate students, assessed the progress made toward those goals. The committee acknowledged MIT's successes in many areas, including making the residential system central to the undergraduate experience and improving opportunities for community interaction. The CJAC report also identified several areas where progress has not met expectations, or new challenges have been identified. These areas include advising, dining, improvements in facilities, first-year fellowships for graduate students, and leadership development, among others. Plans for each of these topics are addressed in this accreditation report.

MIT's education and student-life divisions and departments are developing plans at a time of maximum challenge but considerable opportunity. We are challenged by the prospects of constrained resources over the next several years, but we have an opportunity to continue a decade-long upward trajectory by continuing to attract extraordinary students, increase diversity, and create an environment and services that maximally benefit students and that students rate highly.

Success in these efforts will require a strong partnership between the administration, faculty, and students. Strengthening communication is a topic explored in Chapter 3, "Organization and Governance." However, it is worth noting here that the deans for student life, undergraduate education, and graduate education, along with the Chancellor's Office, are working with students on a number of improvements. Pilots of several programs—including dinners with the deans and the chancellor, and online comment forms for each dean—are already under way. Students, faculty, and administrators are collaborating on additional ideas that would allow all parties to share ideas and information more openly and regularly. Students serve on a large number of Institute committees, and undergraduates and graduate students are also serving on every working group of the current Institute-wide Planning Task Force. These working groups, one of which focuses on issues of student life, are examining ways to strengthen MIT in the context of reduced resources. A report from the Task Force is due in fall 2009.

The Institute's Campaign for Students includes a $200 million goal for funding student-life and learning initiatives. The campaign, now over halfway toward its $500 million target, makes the case for supporting MIT's financial aid for undergraduates and graduate students, and for investing in our plans to make an MIT education an even more transformational experience through residential and academic programming.

Not all future plans revolve around finances; some involve leveraging the resources MIT already has in abundance. As discussed earlier in this chapter, the Division of Student Life seeks to engage alumni more strategically going forward. After a multiyear effort and overwhelming success in reengaging graduates of the fraternities, sororities, and independent-living groups with their former groups, a plan is now being put in place to connect MIT alumni to many other areas of student life. Alumni experiences and ties are invaluable to current MIT students, and this program will be a top priority for the Division of Student Life in the coming years. Already, for example, the Alumni Association is partnering with students of one residence hall (Next House) to develop a pilot program to facilitate alumni participation in dorm life.

Chapter 7: **Library and Other Information Resources**

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- *Technology for managing course content*
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MIT's library and information resources are integral to our teaching, learning, and research. From inventing digital platforms that make subjects come alive, to developing new ways to share course content with the world, MIT harnesses the educational potential of technology in creative, dynamic ways. Subjects like "Visualizing Cultures" wed images and scholarly commentary to illuminate social and cultural history, while our Technologically Enabled Active Learning classrooms use animated simulations to help students visualize concepts and carry out experiments. Reflecting our commitment to service to the nation and the world, our OpenCourseWare (OCW) site is a pioneering experiment in the sharing of knowledge. Through OCW, core teaching materials from virtually the entire MIT curriculum – over 1,800 classes – are published on the Web and made available to a worldwide audience for free.

These initiatives demonstrate that as MIT develops and adapts technology—and applies it to education—the daily experience of students at the Institute and around the world can be transformed. Within this environment, libraries continue to play a critical role. The MIT Libraries are realigning to better enable the design and delivery of information services based on the needs of a broadly networked interdisciplinary community. Informed and driven by a deep commitment to a service model, the MIT Libraries are well positioned to anticipate the emerging information requirements of faculty, students, and researchers. Through the development of new tools such as DSpace, an online repository, they have set a new global standard for how digital preservation can work in the life of a university. This chapter explores our work within the MIT Libraries and our IT infrastructure to ensure that our information resources meet the demands of MIT's educational mission.

I. MIT LIBRARIES

The mission of the MIT Libraries is firmly aligned with that of MIT:

> *The mission of the MIT Libraries is to create and sustain an intuitive, trusted information environment that enables learning and the advancement of knowledge at MIT. We are committed to developing strategies and systems that promote discovery and facilitate worldwide scholarly communication.*
>
> — MIT Libraries mission statement, adopted in 2003

This focus on quality, relevance, and distinction is manifested by a service culture that is constantly evolving to meet the needs of MIT's dynamic users. The ongoing goal is to provide immediate, quantifiable benefits to faculty and students in the Libraries' domains of responsibility.

Background

The MIT Libraries are centrally funded and managed, but physically dispersed. The system is composed of five large "divisional" libraries that map roughly to the five schools of MIT; two smaller, specialized branch libraries; a community space in the Stata Center academic complex; and several small, cost-recovered services units. In addition, the library system includes the Institute Archives and Special Collections, which have responsibility for the Institute's records-management program. Approximately 40 percent of the Libraries' collections are housed in two off-site storage facilities. For the most part, resource development, technical services, administration and budgeting, and technology support and service are centralized. In 2007, the Libraries assumed responsibility for managing Academic Media Production Services, providing the MIT community with support for video production and postproduction, online video, technology support for distance education, multimedia, and video conferencing.

MIT's physical collections total 2.8 million volumes. They exhibit the current and historical strengths of the Institute itself, reflecting MIT's deep intellectual commitment to "science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century." Serials, currently numbering about 23,000, dominate the collections and collection expenditures. In 1932, the MIT Libraries joined the Association of Research Libraries, becoming the first technically oriented member.

MIT's community of faculty, students, and researchers is highly mobile. At a time when no commercial services were available, the Libraries developed a tool known as Vera to provide a network-accessible, customized gateway to the licensed electronic databases, books, and full-text journals provided by the Libraries. Alternative discovery tools are also available through links within Barton, the Libraries' online catalog, and via full-text links from Google Scholar. A book- and- image scanning initiative is the latest addition to the Libraries digital library program. The Libraries' Technology Operations Group provides technical support to these digital library services as well as to DSpace@MIT. DSpace reflects MIT's tradition of responding to unsolved problems by building our own solutions. With support from Hewlett-Packard, we created the system as an online digital repository based on an innovative, open-source program we designed. The MIT research community produces a huge range of electronic documents, images, data sets, and other files. Through DSpace, MIT is housing over 32,000 items and keeping them readable, accessible, and searchable, effectively forever. Since its release as open source software in November 2002, DSpace has achieved widespread adoption at research universities throughout the world.

Leading-edge digital library research using grant and research funding is conducted by the Libraries Technology Research and Development Group. The unit collaborates extensively with faculty at MIT, the World Wide Web Consortium, technology companies, and other institutions to develop applications and address digital library challenges; projects include SIMILE,to enhance inter-operability among digital assets, and FAÇADE, to create preservation strategies for computer-aided architectural design documents.

The Libraries' endowment is for the most part restricted to the acquisition of materials and directed largely to the purchase of books and occasionally electronic back files. Recent resource-development

efforts have focused on attracting expendable and endowed gifts to support targeted collection needs and such common research-library needs as conservation, rare-book programming and stewardship, and the digitization of valuable historical collections.

Service model

The Libraries' service model is based on a strong, talented staff of some 35 subject-specialized librarians who have responsibility for liaising with discipline-specific communities at MIT. This subject-based approach to building and maintaining relationships with faculty and students not only provides deep knowledge of activities and needs in the predominant departments, laboratories, and centers at MIT, but also informs the ongoing development of new services and tools to anticipate the emerging requirements of faculty, students, and researchers. Close collaboration with MIT's central information-technology organization is also an essential component of the Libraries' service strategy, as many of the services provided rely on the security and robustness of MIT's network.

Integration of print and electronic resources has been supported through services designed to deliver print materials such as articles and books directly to faculty desktops. During the last decade, the Libraries also have invested in staff , technology, and information content to meet new and emerging interdisciplinary needs, including needs for social-science data services, geographic information systems, bioinformatics, and copyright management.

Layered onto this service core are the goals of simplifying access to the Libraries' materials, services, and staff expertise, as well as instructing students in the skills needed to effectively find, evaluate, and use information to support their learning and research at MIT and after graduation. One tactic for accomplishing these goals is to develop self-teaching tools that provide community members, no matter where they are, with unmediated, 24/7 access to resources and services, Another tactic is to partner with faculty and other teaching staff to integrate lifelong learning skills into classroom and laboratory work.

Training to make effective use of resources

Following the recommendations of the faculty Task Force on Student Life and Learning in 1998, the Libraries developed a program to become more engaged with the teaching activities of the Institute. Formal instructional programs are now offered throughout the year, but most notably in January, April, and July. A technology- and video-enabled classroom has been developed, and courses are increasingly available around the clock on the Web.

In 2007 the Libraries received a grant from the d'Arbeloff Fund to integrate core scholarly research skills into the curriculum of 3.091, a popular undergraduate chemistry General Institute Requirement (GIR). Partnering with faculty members and the Teaching and Learning Laboratory, the Libraries have begun a multiyear assessment to determine the impact of embedding these learning modules into the curriculum. Results to date suggest that the scholarly research curriculum has improved students' online search skills. The Libraries are now approaching faculty who teach alternative chemistry GIRs to consider including this same curriculum in those courses.

This past academic year, library instructional staff began an initiative to assess the effects of library instruction related to other courses. The pilot included 154 undergraduate students involved in 14 different courses from a variety of disciplines. Preliminary results suggest that students benefited from the library research training they received:

- Fifty-six percent agreed or strongly agreed that the training enabled them to identify appropriate databases/tools to complete class projects.
- Sixty percent agreed or strongly agreed that because of the library training, they are more likely to experiment with unfamiliar databases or tools for different subject areas.
- Fifty-three percent indicated they had used what they had learned in other classes.
- Twenty-six percent reported using what they had learned for purposes unrelated to coursework.

Other more routine surveys conducted by the Institutional Research arm of the Provost's Office confirm solid satisfaction rates among all key client groups of the Libraries. In 2005, in partnership with the Office of Institutional Research, the Libraries conducted their own major survey of faculty, undergraduates, graduate students, and research staff, with the goal of gathering information about the community's awareness of, use of, and satisfaction with the Libraries' services. Three priorities emerged for all library users: (1) improve access and navigation among and between print and electronic journals, books, and databases; (2) acquire additional years of electronic back files of heavily used digital information resources; and (3) develop a more systematic internal communication and marketing program. These findings contributed to a number of new service initiatives.

Recent improvements to space

Institute funds together with donor-supported investments have produced many improvements in facilities, including repairs to the Building 14 courtyard, a major project to repoint the Building 10 dome to protect the Barker Engineering Library, a much-desired 24-hour study room in the Hayden Building, substantial upgrades to security and the working environment in the Institute Archives, more shelving capacity in on-campus and near-campus facilities, consolidation of research and systems staff members into one location, a special-collections exhibition gallery, and a state-of-the-art preservation and conservation facility.

In 2007, the Committee for the Review of Space Planning committed to funding a three-year project to renovate the Dewey Library for Management and Social Sciences. This important initiative addresses many outstanding issues for this heavily trafficked facility and for its large, diverse community of users. Additional renovations at this scale are a high priority, and the Institute is considering its options.

Planning

The Libraries' planning efforts are firmly tied to the Institute's overall management and planning structure. The library director is a member of the Academic Council and the Deans Group, as well as a member of the faculty under the Rules and Regulations of the Faculty, and reports directly to the provost. The Faculty Committee on the Library System also provides oversight and guidance. In addition, MIT's visiting committees review and help shape the Libraries' activities and plans. Internally, the Libraries' organization is made up of four directorates: Administrative Services, Information Resources, Public Services, and Technology Research and Development. The Library Council, chaired by the library director and composed of the associate directors and department heads, coordinates the work of more than a dozen functional departments.

The Libraries' Strategic Plan (libstaff.mit.edu/lc/sp2005.html) guides current efforts. Planning is based on quantitative and qualitative assessment of existing services and resource provision, as well as methods for understanding user needs and views. A 2005 user survey referenced above was followed by another survey in fall 2008 to provide feedback on current services and future directions. In both surveys, 89 percent of respondents in all categories indicated being satisfied or very satisfied overall with the MIT Libraries, with the number of "very satisfied" respondents rising 4 percent in 2008

The Libraries also invest in understanding user behavior by conducting usability tests of their online systems and carrying out ethnographic studies to assess user needs.

Collaboration

Crucial to the success of the Libraries is fostering and maintaining key collaborations, both externally and internally. At the national and international levels, the Libraries are institutional participants in the Association of Research Libraries, the Coalition for Networked Information, EDUCAUSE, the DSpace Foundation, the International Federation of Library Associations, the International Association of Technical University Libraries, the Council on Library and Information Resources, and the Ivy Plus

Group. Locally, key partnerships with the Boston Library Consortium and the Harvard Libraries provide important professional relationships for MIT Libraries staff and valued resource-sharing benefits to faculty and students.

Within MIT, the Libraries' collaboration extends beyond the obvious core relationships developed with departments, centers, and laboratories through its service model. Working with Information Services and Technology, the Office of Educational Innovation and Technology, and OpenCourseWare, the Libraries provide leadership for the ACCORD initiative. ACCORD is designed to ensure that all campus providers of academic computing services work together in a cohesive and transparent manner to offer faculty and students seamless and responsive service. One initiative is the development of the Image Services website (web.mit.edu/teachtech/image.html), which provides a convenient, comprehensive list of various tools and services available for acquiring and using digital images. the design of new infrastructure and process workflow to support the key services that support the course content lifecycle—such as Stellar, OCW, and DSpace. Other ongoing initiatives include designing new infrastructure and workflow processes; clarifying the procedures for obtaining academic software; and reviewing policies and procedures relating to video production and management for courses.

The Libraries also participate in MIT's Council on Educational Technology, which oversees educational-technology policy; the Information Technology Strategic Planning and Resources Coordinating Council, which functions as the strategic coordinating body for information technology at MIT; and the Information Technology Architecture Group, which sets directions and makes recommendations for the Institute's information-technology infrastructure. Finally, the Libraries work closely with the associate provost and vice president for research, and with the MIT Press and *Technology Review,* to develop strategies for supporting the extended educational and research mission of MIT.

II. PROJECTIONS: LIBRARY

The Libraries' programs and financial planning in the years ahead will be affected by (1) the Institute-wide Energy and Environmental Initiatives; (2) the recommendations of the Task Force on the Undergraduate Educational Commons; and (3) MIT's growing international programs. Areas of future attention will include ongoing investments in library collections, contract complexities resulting from international collaborations, orientation programs for international students and visitors, tools for teaching, and technical infrastructure for the global delivery of education.

In fall 2008, the MIT Libraries initiated a planning process to consider options for revising their organizational structure. The expanded leadership of the Libraries believes that the MIT Libraries must realign in order to design and deliver information services that are based on the needs of a broadly networked interdisciplinary community. The initial phase of this effort—defining the desired future state—is well under way. An added sense of urgency to redesign the Libraries' organization has resulted from the Institute's current fiscal challenges. The Libraries will need to be creative and resourceful to continue supporting MIT's mission with reduced resources.

Digital Library Program requirements

The MIT Libraries have focused their digital library research interests primarily on the "born digital" aspects of information production, stewardship, and long-term preservation. To this end, the Libraries' digital library efforts are concentrated in such areas as tools development (Vera), digital archive functionality (addressing topics such as DSpace@MIT, MIT theses, and the MIT Press), information interoperability in the Web environment, and preservation strategies for proprietary works such as 3-D computer-aided-design systems. Donors have recently stepped forward to fund the digitization of portions of the Libraries' rare and unusual collections; these and other works are being scanned for inclusion in the

Libraries' locally hosted digitized collections, where they will be shared with the Open Content Alliance, an international collaboration to build an open archive of digital texts and multimedia material.

Archival materials deposited with the Institute archivist are increasingly in digital formats that require specialized handling and attention, as do the video and sound recordings of important institutional events. MIT faculty are similarly interested in the capacity of MIT's Archives to appropriately manage prestigious faculty papers in the digital age. OpenCourseWare courses, MIT World videos, and various teaching courses that produce and use video content for educational purposes must be archived in digital form. Policies and practices are being revisited to ensure a coherent strategy for managing this growing corpus of important multimedia materials.

The Libraries must also accommodate ordinary faculty research output and teaching materials, such as visual images and data sets, that are increasingly produced in electronic and multimedia formats. Participation in national solutions for preserving these resources, along with peer-reviewed digital serials and journals, is essential to MIT's future.

Support for improved scholarly communication

Under MIT policy, certain aspects of copyright education, advice, and management fall to the MIT Libraries. As this legal and regulatory environment has increased in complexity, the Libraries have added capacity and partnered with the Office of the General Counsel to better inform, advise, and support faculty and researchers on the issues associated with copyright management and scholarly communication. With assistance from the Office of Sponsored Programs and the vice president for research, mechanisms have been developed to facilitate compliance with regulations regarding publication of certain sponsored-research results.

In March 2009, the MIT faculty voted unanimously to make their scholarly articles openly available. The implementation of the MIT Faculty Open Access Policy is the responsibility of the Faculty Committee on the Library System, with support provided by the Libraries.

III. OTHER INFORMATION RESOURCES

Information technology (IT) at MIT actively supports the Institute's academic mission. Our goal is for information technology to be fully integrated into living and learning environments, whether in the classroom, in the residence halls, or in communal spaces. For prospective students today, campus technology is a key factor in selecting a school; therefore, upgrading technology and integrating it into the educational experience are priorities for MIT. For example, the School of Humanities, Arts, and Social Sciences is exploring the potential of new media technologies to enhance education and research in the humanities. Through Hyperstudio, the school's Laboratory for Digital Humanities, the Global Shakespeare subject allows students to explore cultural differences in Shakespeare texts and performances from around the world. For *Hamlet* alone, there are more than 1,000 works of art, illustration, and films from which students can learn.

Managing the technological platforms and providing support for MIT's information resources takes place at both at the school level and centrally. The faculty-led MIT Council on Educational Technology (MITCET), reviews programs and sets high-level strategy for technology in this arena. MITCET's mission is to enhance the quality of MIT education by encouraging the appropriate application of technology, both on and off campus.

Many IT services are provided by our central IT organization, Information Services and Technology (IS&T). A number of more specialized systems and services are provided by IT groups in the Libraries,

the Office of the Dean for Undergraduate Education, OpenCourseWare, and several schools and departments. These groups help us leverage technology as an academic tool to enhance the overall student experience and prepare students for what they will encounter in their chosen professions.

MIT is keenly aware of the need to provide coordinated support to the community. Several of the major programs currently under way across campus are highlighted below.

Office of Educational Innovation and Technology

Technology is frequently perceived as merely augmenting existing teaching and learning practices. In fact, it can alter the way that students process what they are learning, and consequently change the way they construct knowledge. Using interactive visual representations of astronaut motion and of protein molecules, to classroom clickers and wikis, MIT faculty are incorporating technology into their teaching in an variety of ways to support student learning. To accelerate these efforts, MIT's Office of Educational Innovation and Technology (OEIT), located within the Office of the Dean for Undergraduate Education, engages in exploratory activities to identify technology-based solutions for new modes of collaboration, production, and the sustainable delivery of educational resources and experiences.

As described in Chapters 4 and 5, OEIT not only acts as a conduit to communicate the availability of educational innovations more widely to faculty, but also facilitates the adoption of these innovations, wherever they may have been developed, to help improve teaching and learning at MIT.

OEIT focuses on three key areas: bridging research and learning, linking digital content to the curriculum, and fostering communities of innovation and practice. For example, through visualization tools used in Biology and Hydrology, the OEIT is transforming the research tools that faculty and researchers use daily into applications that support learning, thus providing early exposure to the research process. As demonstrated in its work with programs such as Visualizing Cultures and the Spoken Lecture Browser Project, the OEIT enables transparent and immediate access to image and video content from diverse sources, such as the Roche Visual Collection, Boston's Museum of Fine Arts, the Edgerton Archives, and MIT OpenCourseware.

OEIT is also helping MIT faculty explore educational opportunities with emerging technologies and innovative practices, such as Tablet PCs for collaborative learning; GIS Tools for spatial data analysis; high-performance computing for science and engineering education; as well as flexible learning spaces that incorporate intelligent combinations of situated, cyberspace, formal, and non-formal environments to support blended learning. More information can be found at: (http://web.mit.edu/oeit/index.html). OEIT's work over the past two years has involved 120 faculty and 110 courses. Tools developed for one class can often be expanded to others. For example, StarBiochem – a 3-D visualization tool that allows users to selectively view elements of a molecule, was first used in MIT's Introductory Biology course in the fall of 2006, and is now used by 800 students in three different Introduction to Biology (7.01x) subjects. = OEIT places particular importance on developing and supporting tools and applications for a wide range of courses that advance the recommendations of the MIT Task Force on the Undergraduate Educational Commons. Case studies and publications can be found at (web.mit.edu/oeit/browse/index.html).

OEIT receives strategic guidance from the MIT Council on Educational Technology and works closely with the Teaching and Learning Lab, the Office of Faculty Support, the Office of Experiential Learning, as well with IS&T and the MIT Libraries.

Access to IT resources

Through a rich array of computing resources, members of the MIT community can take advantage of educational technology, share information and programs, communicate with each other, and work together on problems and ideas in creative ways. The IS&T website provides information about many of MIT's resources, and IS&T encourages students to call or e-mail with questions and to visit the

department during orientation and at events throughout the year. In addition, before arriving at MIT, incoming first-year students receive a letter recommending options for computer purchases. Although students are expected to acquire their own computers (and 96 percent do), the Laptop Loaner Program was initiated to ensure that all students have the computational resources to do faculty-assigned academic work.

Athena system

The Athena system is a centrally managed, campus-wide computing environment consisting of networked client workstations, servers, and printers available to MIT students and faculty to help them achieve their academic goals. This scalable and secure system provides:

- Electronic "course lockers" for storing personal and course-related materials
- Electronic tools for easily and securely delivering Web pages
- Software for students and faculty to use in doing coursework
- Software for communication among students and between students and instructors

In addition to standard compilers, Web browsers, and communications tools, Athena offers both cross-disciplinary and specialized applications, including FrameMaker, Matlab, Maple, Mathematica, Molecular Simulations, SAS, S-Plus, Tecplot, ArcInfo, ArcView, and Xess.

Policies regarding appropriate use of technology resources

MIT's IT policies provide a framework for the responsible use of the Institute's computing and telecommunications resources. These policies require compliance with relevant legal, contractual, and professional obligations whenever information technology is used. In addition, individuals using Institute resources may not interfere with the appropriate uses of information technology by others. The MIT Libraries likewise specify the appropriate uses of library resources and technology, and outline the standards of behavior expected of members of the MIT community and visitors alike.

IT policies also cover the privacy of Institute records; information security and preservation; the privacy of electronic communications; and the acquisition and use of third-party products and services. Institute Archives policies similarly address the access and use of Institute records and related equipment.

The Institute also has a responsibility to present clear guidelines on the proper use of all copyrighted materials, particularly digital ones, and to disseminate information on these policies. Working with the Office of the General Counsel, IS&T and the MIT Libraries have helped produce a unified, online source of information on copyright for the MIT community: Copyright at MIT (http://web.mit.edu/copyright/).

Evaluating IT effectiveness

IS&T takes seriously community evaluation of IT resources and has several mechanisms for gathering this information and using it to guide strategy.

Since 2002, IS&T has conducted a customer-satisfaction survey every 18 months. This survey is distributed to a random sample of the MIT population in order to collect objective data about what is working and what could be improved. While certain survey questions have changed as technologies have evolved, other questions have been kept consistent to track changes in users' views over time. The most recent survey was distributed in October 2008 to approximately 1,500 faculty, staff, and students. IS&T received 605 responses—a robust 40 percent response rate.

When respondents were asked about their perception of IS&T services over the past year, 90 percent indicated that services had improved. Furthermore, the department's overall satisfaction score rose from 4.79—on a six-point scale—in May 2002 to 4.93 in October 2008. Survey respondents were most satisfied with the professionalism and technical ability of the help desk, with the wired network, with IS&T's ability

to consistently keep systems running, and with IS&T's network-services operation overall. In 2003 and 2005, customers expressed dissatisfaction with the help desk; now, in a comparison with 10 other universities surveyed by a consultant, MIT's help desk ranks the highest.

While the 2008 survey showed across-the-board increases in satisfaction, the data also revealed some areas for improvement. Principal concerns for all users were the effectiveness of spam-screening methods (which were subsequently upgraded), the process for setting spam thresholds, the signal strength of the wireless network in certain locations, and overall remote access from outside the United States.[37]

IS&T's higher ratings overall reflect concentrated efforts to improve three core services—the network, e-mail, and customer help. To address areas of current dissatisfaction, several projects are under way, including a new e-mail/calendaring solution, the rollout of campuswide VoIP (technology for delivering voice communications over Internet-protocol networks), and a full-scale overhaul of the wireless network infrastructure to one of controller-based 802.11n access points that can regulate their signal strength automatically. The satisfaction surveys help IS&T determine where needs are greatest, and they provide a systematic mechanism for gauging the department's effectiveness. We anticipate that the 2010 survey will show satisfaction rising in additional areas, while pinpointing weaknesses that still require attention.

To further guide our efforts, IS&T created a student advisory board, ISTAB, to gather input and feedback on services from student customers. ISTAB members raise issues directly with those responsible for particular services within IS&T. In addition, ISTAB engages with a wide variety of other student groups, including the MIT Undergraduate Association, Graduate Student Council, MIT Student Information Processing Board, Association of Student Activities, and student IT representatives from schools and departments. IS&T staff attend ISTAB meetings to respond to questions, make presentations, and facilitate the conversations.

IV. PROJECTIONS

Technology for managing course materials

MIT uses three primary services to support its course content lifecycle. MIT OpenCourseWare (OCW) is used for Web-based publication of virtually all MIT course content and is described more fully in Chapter 10, "Public Disclosure." DSpace, addressed earlier in this chapter, is MIT's institutional repository of online research materials, built to save, share, and search research documents that are in digital form (course materials, working papers, theses, conference papers, and more). Finally, Stellar is designed specifically to support individual courses at MIT, providing a framework for posting course content and other materials on the Web. In 2008-09 Stellar was used for over 80 percent of the classes at MIT.

Currently, these three course-content systems operate on independently developed platforms. Seeing the need for integration without compromising the separate objectives of DSpace, OCW, and Stellar, MIT launched the DOS (DSpace OCW Stellar) initiative. The goal of this initiative is to improve the effectiveness of MIT educational systems by providing a common infrastructure and processes that enable faculty to easily publish new teaching materials and easily use existing materials, while allowing students to access those materials using the technology medium of their choice. Key technology enhancements planned as part of this initiative include replacing OCW's aging content- management system, replacing or enhancing Stellar's current platform, providing enterprise infrastructure support for DSpace, and improving data interoperability.

[37] A summary of the changes in ratings from May 1999 to October 2008 can be found at http://web.mit.edu/ist/survey/2008/changes-in-ratings.pdf. For the complete report, see http://web.mit.edu/ist/survey/2008/report.pdf.

MIT Student Information System

The MIT Student Information System (MITSIS) comprises more than 100 administrative systems that serve all of the student services at MIT, including registration and academic records, student financial services, academic departments, housing, and medical.

MITSIS provides information and curriculum planning tools to aid students and their advisors in selecting courses and planning for the upcoming semester and future years. Using MITSIS tools, students can search online for subject offerings that meet their interests and degree requirements. They can then select subjects for pre-registration and view potential class schedules to identify time conflicts.

Advisors can view advisee information online to learn about their students and prepare for their advising discussions. Information available to advisors includes each advisee's pre-registration subjects, academic record, status of registration, degree audit, student photo, and other biographic information. Advisors use this information to stay up to date on their advisees' progress and plans, and to help students map out their curricula and activities.

As described in Chapter 4, MITSIS is also being piloted by faculty and students for online evaluation of subjects at the end of each term. Over the next few years, MIT intends to move away from paper-based forms and toward a central system of online evaluation. Parallel efforts will be taken to improve data on the quality of teaching and the ease with which it is collected. The Office of Faculty Support (under the direction of the dean for undergraduate education) administers the Institute's subject-evaluation process. The office is using MITSIS to improve this process and to provide meaningful data for the intra-departmental and cross-departmental evaluation of MIT's teaching. Sixteen departments pilot the system, and more are scheduled to come on board in the coming year.

Envisioning a new student-information system

While MITSIS is meeting the day-to-day needs of faculty and students, it was designed nearly 20 years ago. It was originally intended primarily for administrative use, but today's students and faculty expect a more student- and faculty-centric system. To plan for needed changes, MIT initiated the Student System Vision (SSV) study in 2007. The dean for undergraduate education, the dean for graduate education, the dean for student life, and the vice president of IS&T are sponsoring this collaborative project led by Information Services and Technology.

Understanding the needs of all constituents who work with student systems is of the utmost importance and requires Institute-wide collaboration. The SSV project team hosted workshops, meetings, focus groups, and presentations that involved faculty, staff, and students from across the Institute. These activities tapped into MIT's collective intelligence to ensure an in-depth understanding of immediate needs and long-term expectations regarding student systems. An SSV Faculty Advisory Group with participants from MIT's Council on Educational Technology joined the effort, and an outside consulting firm facilitated the overall process. MIT wanted to ensure that the recommendations coming out of the study represent a broad consensus on where MIT would like to be—a true vision of student systems in the future.

In spring 2008, the SSV team presented its findings, along with a plan for implementing the next-generation MIT student-information system. The team's report is now being evaluated by various faculty committees and the administration. Additional planning and analysis are continuing, and the implementation likely will span many years.

I. OVERVIEW
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IX. PROJECTIONS

The MIT campus comprises a wide array of physical and technological resources that support the academic and research pursuits of students and faculty. Personnel charged with developing and managing these resources have in place a network of planning and operational protocols designed expressly to provide continuous feedback and interface between the teaching and research community and the administration. Through continuous feedback with student and faculty users, MIT is able to maintain and adapt the physical and technological resource base to support the internationally recognized teaching and research that occurs on campus.

The overall composition of the physical and technological resources on campus is driven in part by MIT's long-held practice of students and faculty shaping the teaching and research pursuits of the Institute. Because the needs of faculty and students are dynamic, the Institute seeks to develop physical and technology resources that offer flexibility to support the evolving needs of the MIT community.

I. OVERVIEW

Since MIT's move from Boston's Back Bay across the Charles River Basin to Cambridge in 1916, its campus development has occurred in major cycles of building construction. Overall, these cycles of growth have supported the academic and student-life mission of the Institute by accommodating new scientific and technological developments and by supporting the residential life of a growing MIT community. Corresponding with significant capital campaigns, these periods of campus expansion have, on average, added about 1 million gross square feet (GSF) per decade.

The original campus buildings were designed by architect William Welles Bosworth and dedicated in 1916. Known as the Main Group, these buildings housed the Institute's science and engineering curriculum and were interconnected to encourage communication across the disciplines. In the 1940s and 1950s, MIT constructed a number of athletics and cultural buildings supportive of activities outside the classroom and critical to the modern architectural character of the Institute. The 1960s was a period of unprecedented campus growth The Institute added new buildings of all functional types—from laboratories to a student center to family housing—to accommodate expansion in all areas of research and to strengthen MIT's budding residential life.

The most recent capital program has resulted in an array of new and renovated facilities. Some support emerging areas of research; others create a more appealing living environment for students. Since 1999, MIT has constructed about 2 million GSF of new buildings, and renovated others. The Institute has added a natatorium and fitness center, new undergraduate and graduate residences that feature community spaces and other amenities, and major new academic facilities, including the recently completed Green Center for Physics, the Brain and Cognitive Sciences Complex, and the Stata Center.

The current development program continues MIT's balanced support of academic and student life. By 2010, the Institute will complete the construction of three new teaching and research facilities: the 217,000 GSF MIT Sloan School of Management complex; the 367,000 GSF Koch Institute for Integrative Cancer Research for the Schools of Science and Engineering; and the 163,000 GSF Media Lab extension for the School of Architecture and Planning. In addition, the Institute will complete significant renovations to existing buildings, make street and landscape improvements on campus, add more underground parking, and make utility upgrades to the Institute's central plant to support the new and renovated buildings. These facilities will provide space for the collaborative multidisciplinary research that is an MIT hallmark, and ultimately will provide new opportunities for teaching, learning, and community building at the Institute.

Today, MIT's Cambridge campus sits on 168 acres stretching over a mile along the Charles River. The Institute also has properties in Middleton (80 acres) and Tyngsboro (1,242 acres), MA, which house the Bates Linear Accelerator Center and the Haystack Observatory, respectively. In addition, MIT owns approximately 20 acres in Lexington, MA, adjacent to Hanscom Air Force Base; this is the site of Lincoln Laboratory, a federally funded research and development center focused on issues of national security.

II. FACILITIES PLANNING AND OPERATIONS

Planning for the development of the Institute's facilities is guided by the work of the Building Committee and the Committee for the Review of Space Planning. The Building Committee—chaired by the executive vice president and including the president, provost, chancellor, and other senior officers—is responsible for reviewing and approving capital projects over $5 million.

The Committee for the Review of Space Planning (CRSP), chaired by the associate provost, is the advisory body to the provost. CRSP makes decisions and recommendations related to space, planning, and capital projects under $5 million. The CRSP membership includes representatives from academic, research, and operations areas of the Institute. All requests for additional space and space changes are submitted to CRSP. On an annual basis, CRSP allocates approximately $20 million of the general Institute budget (GIB) to fund a variety of capital projects and studies related to space planning. CRSP funding is frequently supplemented by resources provided by the schools and departments or by the Capital Renewal Fund. During the past seven years, the total annual funding for CRSP-administered projects has ranged from $40 million to $50 million.

The Institute recently completed an in-depth, data-driven planning study known as Workstreams. The eight components of this interdisciplinary investigation documented current conditions and future needs in eight areas: program-driven projects; capital and capital renewal; facility space; energy efficiency; information technology; the Urban Ring (a regional transit proposal); transportation planning; and urban design and development of the Mass. Ave. corridor.

The Workstreams process resulted in a series of technical memoranda and preliminary recommendations. These recommendations, along with information from each of the schools and various departments on their respective long-term visions, have formed the foundation for Vision 2030—the Institute's effort to develop a framework to guide long-term capital-planning decisions.

The Department of Facilities includes teams of technical professionals charged with tasks ranging from long-range planning and design to maintenance, construction, and operation of the campus. The activities of these teams are coordinated by the director for campus planning, engineering, and construction and by the director of security, operations, and utilities, both of whom report directly to the executive vice president and treasurer. Because of the role the Department of Facilities plays in supporting teaching and research space on campus, there is continuous communication between department personnel, the associate provost for space planning, and a broad range of faculty, staff, and students. Through this communication, the department seeks to design and coordinate maintenance, construction, and repair activity that sustains the teaching and research demands of MIT.

III. ENVIRONMENT, HEALTH, AND SAFETY

MIT is committed to excellence in environment, health, and safety stewardship on campus, in the larger MIT community, and globally. This long-held commitment is demonstrated through MIT's contributions to environment, health, and safety research and teaching, as well as through its institutional conduct (see the EHS policy document in the accreditation team room).

The Institute's Environment, Health, and Safety (EHS) Office, and its EHS Management System (EHS-MS), were created to further MIT's commitment to protecting the environment, health, and safety of its employees, students, visitors, and surrounding community, while supporting the unique requirements of a research and academic center. The EHS-MS is a tool to help all MIT departments, laboratories, and centers manage five major responsibilities: organization; space registration and assessment; inspections; training; and accident and incident reporting and investigation.

EHS plays a key role in reviewing experiments that involve biological, chemical, and radiological agents. In this capacity, EHS evaluates hazards, assesses risk, and designs and implements controls to minimize risk to people and facilities.

In the last decade, EHS has been responsible for some major accomplishments:

- Hazardous-chemical-waste costs per pound of waste have decreased almost 40 percent since 2002. Hazardous-waste volume has decreased almost 10 percent in the past two years, despite an increase in research volume.
- Since 2002, participation in EHS training has increased 600 percent. EHS has filled 26,500 individual seats in its training courses, and 11,800 individuals have taken at least one course.
- MIT's incidence rate for reportable injuries and illnesses is approximately 10 percent below the national average for universities.
- In potentially hazardous areas identified during EHS inspections, the Institute has provided emergency eyewashes and showers or contaminant-control ventilation.
- All capital budget projects and space renovation plans have been reviewed with respect to EHS issues—such as fire safety, human safety, and ventilation—and appropriate changes have been made.

IV. CAMPUS ACCESSIBILITY

Prior to implementation of the Americans with Disabilities Act (ADA) in 1992, MIT had initiated projects to improve the general accessibility of campus facilities, and it had met all code requirements for renovations and new construction. ADA provided the impetus for a major program to upgrade the existing campus with accommodations for persons with disabilities. In the 1990s, the Institute made improvements to walkways, entries, elevators, toilets, and other physical features, which opened access to all parts of the Institute and placed facilities and services within reasonable reach for all. Renovations also were made to heavily used buildings such as auditoriums, athletics and recreation areas, and other activity centers. Between 1993 and 2008, MIT undertook over $10 million of projects to improve accessibility on campus.

V. CAMPUS DEVELOPMENT, 1999–2009

As noted earlier in this chapter, MIT has built approximately 2 million GSF of new buildings since 1999. In addition, it has partially or fully renovated approximately 1.3 million GSF of space in 23 buildings, including 37 percent of the current classrooms, and it has constructed 818 underground parking spaces. Other highlights of MIT's construction program include:

- The scheduled completion (by 2010) of three new academic/research buildings
- The renovation of 85 classrooms and the addition of 17 new ones
- New housing to accommodate 350 undergraduates and 1,290 graduate students
- The renovation of existing student housing to add 778 beds for undergraduates and 120 beds for graduate students
- Strategic improvements to campus landscaping and the longest individual streetscape adjacent to the campus (Vassar Street)

The construction projects have contributed to meeting programmatic needs while adding to the Institute's architectural diversity. In the last decade, MIT has become a campus transformed.

New construction

Academic and research

Included in the 463,300 GSF of the Stata Center are public space, laboratories, offices, and seven new teaching spaces ranging from 60-seat classrooms to an auditorium seating more than 300. The distinctive design of the Stata Center reflects the belief that researchers and students are highly creative and highly social thinkers whose research benefits from chance encounters and casual conversation across disciplines.

The Brain and Cognitive Sciences Complex is a 413,600 GSF laboratory and office building housing three organizations: the Department of Brain and Cognitive Sciences, the McGovern Institute for Brain Research, and the Picower Institute for Learning and Memory. The Brain and Cognitive Sciences Complex is the largest neuroscience center in the world, an interdisciplinary research and teaching facility that integrates these pioneering institutions devoted to uncovering the mysteries of the brain.

The Green Center for Physics included 49,000 GSF of new construction and 79,000 GSF of comprehensive renovation of adjacent existing buildings in the center of the MIT campus. This facility provides a home for the Department of Physics, additional space and entrances for the Department of

Materials Science and Engineering, and a new spectroscopy laboratory. The new space is designed to enhance interactions among faculty, students, and staff across these three groups.

Seven Cambridge Center (7CC) is a 231,028 GSF office and laboratory building housing the Broad Institute, a multi-disciplinary institute with a mission to propel progress in biomedicine through research aimed at the understanding and treating disease. Founded in 2004 as a collaboration between MIT, Harvard University, the Whitehead Institute, and the Harvard-affiliated hospitals, the Broad Institute is now a separate nonprofit research institute, tightly coupled to the MIT-Harvard biomedical community. MIT led the effort to locate the Broad at 7CC and managed the interior design and construction of the facility.

Residential

Partly in response to the 1998 report from the Task Force on Student Life and Learning, MIT has been striving to create a stronger sense of campus community. One of the immediate goals for residence halls was to house all first-year undergraduates on campus. Those undergraduate housing needs have been addressed through two projects: Simmons Hall and Baker House. MIT completed Simmons Hall (350 beds) and the comprehensive renovation of Baker House (318 beds) in 2002.

MIT has also expanded residential opportunities for graduate students through three construction and renovation initiatives in the northwestern section of the campus. The three facilities—NW30, Sidney-Pacific, and New Ashdown House—together accommodate more than 1,000 additional students. The renovation of NW30, a former warehouse, into a 90,000 GSF (120-bed) residential complex for graduate students offers an attractive alternative to off-campus housing and provides housing for conference-goers during the summer months. Sidney-Pacific (750 beds) is designed to promote community, both inside and outside the building. New Ashdown House (550 beds) also gives residents a sense of community; the complex consists of connected buildings that are three to five stories tall, situated around two courtyards. In 2008–09, 37 percent of graduate students lived on campus.

Athletics and student life

Since opening in 2002, the 125,000 GSF Zesiger Sports and Fitness Center has had a major impact on campus life. The building ties together three preexisting athletics buildings and completes a quad centered on Kresge Auditorium. The Zesiger Center includes an Olympic-class 50-meter pool, an 11,000 GSF fitness center, a 5,000 GSF multipurpose court facility, and six squash courts.

Landscape and infrastructure projects

The Vassar Street project is the complete renovation of a highly visible public corridor that runs for more than a mile though the MIT campus. Another streetscape project greatly enhanced the area between Massachusetts Avenue and Institute buildings by adding trees and other plantings, new sidewalks, and more bicycle parking. Other significant improvements include the creation of nine “pocket” parks and gardens around campus. At the conclusion of the current capital program MIT will have planted in excess of 500 new trees across the campus.

Renovation

MIT’s renovation activities between 1999 and 2009 improved a broad swath of the campus. As noted earlier, roughly 1.3 million GSF were renovated during this period, including:

- 407,000 GSF of academic space
- 113,000 net assignable square feet of classroom space, in roughly 37 percent of MIT’s classrooms
- 223,000 GSF of residential space (133,000 GSF of undergraduate housing and 90,000 GSF of graduate housing)
- 175,000 GSF of administrative or service space

The renovations included significant work on core infrastructure systems in some of the original Main Group buildings. In addition to providing upgraded services for the areas affected, these major

infrastructure-improvement projects enabled the Institute to assess design and construction issues in these nearly 100-year-old buildings, and to develop strategies and techniques for the next decade's renovation projects there.

Construction projects scheduled for completion in 2010

In addition to the projects completed between 1999 and 2009, three projects are under way and due for completion by the end of 2010:

- The new MIT Sloan School (Building E62), a 209,000 GSF academic building, will complete the east end of the campus and give a new face to both Kendall Square and the riverfront. Additionally, the new building will consolidate a majority of MIT Sloan faculty within a single structure and provide teaching, meeting, and food-service facilities for faculty, students, and MIT Sloan's Executive Education program.
- The 365,000 GSF Koch Institute for Integrative Cancer Research (Building 76) will provide a research and teaching environment where faculty and students can share ideas across disciplines and have access to highly sophisticated equipment beyond the scope or budget of any single laboratory. In this setting, life scientists and engineers will collaborate on complex biological problems involving tough technical challenges.
- The Media Lab Extension (Building E14), a 169,000 GSF structure for the School of Architecture and Planning, will include six double-height research laboratories/studios designed to support the cross-disciplinary research and learning nurtured by the Media Lab, while providing much-needed communal, exhibition, and performing space for the School of Architecture and Planning.

Response to the economic downturn

In the area of facilities, MIT has taken two notable steps to reduce the fiscal pressure on Institute budgets. The first step was to implement $5 million reductions in the FY 2010 budgets for capital renewal and the Committee for the Review of Space Planning (for a $10 million total reduction). The second step was to assess cost-cutting options for the current program of capital projects. Because the Media Lab, MIT Sloan School, and Koch Institute projects were at advanced stages of construction, we concluded that suspending these projects or changing their scope would yield no savings. However, we determined that the planned $90 million renovation of Building W1 (a student residence) could be placed on hold, allowing MIT to redirect resources to other programs, including financial aid. Shortly after we decided to postpone the W1 project, an anonymous donor committed $20 million for renovation of the building's exterior. With the support of this gift, MIT will be able to minimize potential deterioration of the exterior envelope before additional funding is available to complete the interior renovations.

VI. INITIATIVES ON DEFERRED MAINTENANCE

Deferred maintenance needs come to light via several sources, including client requests to correct problems, operational experience, and a comprehensive facilities audit completed in 2007 by Vanderweil Facility Advisors.The Department of Facilities addresses deferred maintenance needs collaboratively, drawing on expertise from all functional areas within the department. Decision makers use an analytic deliberative process and follow criteria consistent with Institute goals.

The Department of Facilities has tackled many deferred maintenance projects since 1999. For example, it has:

- Upgraded fire-detection, alarm, and sprinkler systems in all residence halls and acdemic buildings
- Replaced lead-lined water piping in main campus buildings
- Performed system upgrades to support the renovation of classroom, laboratory, and administrative spaces
- Made comprehensive exterior repairs to an academic and research building
- Installed carbon-monoxide detectors in residence halls

- Launched initiatives to remove asbestos, lead paint, and caulking containing PCBs as part of all renovations
- Continued ongoing programs to address items such as roofing and elevators

VII. SUSTAINABILITY AND ENERGY CONSERVATION

Developing and maintaining a sustainable campus requires attention to many systems and interdependence among them. The Institute is employing methods to address new construction, renovations, and energy-system upgrades to improve efficiency across campus.

In new construction projects, MIT is taking an integrated-design approach that uses the expertise of each team member (engineers, contractors, etc.) to create the best possible building for the site and the program. The integrated-design approach has been used for the Koch Institute, the new MIT Sloan School, and NW35 graduate dorm. This process has led to innovative application of systems such as heat-pipe exchangers, demand-based ventilation, day lighting and occupancy sensors, chilled beams and radiant panels, and reduced face velocity for fume hoods.

For renovations and system upgrades, MIT has developed a program of sustainability upgrades that include lighting upgrades, steam-trap replacements, and continuous commissioning of electrical and mechanical systems.

VIII. OVERVIEW OF TECHNOLOGICAL RESOURCES

Over the past five years, MIT has made significant investments in maintaining its IT infrastructure to provide the capabilities necessary for students and faculty to do the advanced research, teaching, and learning that are the hallmark of an MIT educational experience. IT is a dynamic field, and the IT infrastructure now includes wired and wireless high-speed networks, hundreds of servers with specialized software applications, and access to high-performance "supercomputers" in many academic departments.

As noted in Chapter 7, some IT services at MIT are provided by specialized IT groups in the MIT Libraries, the Office of the Dean for Undergraduate Education, OpenCourseWare, and several schools and academic departments. However, MIT's central IT department is Information Services and Technology (IS&T). IS&T has a wide range of responsibilities, from providing the campus network to ensuring critical day-to-day business operations to carrying out strategic planning for IT. Collaborative activities across the MIT community—such as committees and outreach programs—inform IS&T's efforts to meet the needs of all clients.

Networks and connectivity

The original MIT campus network was developed in the late 1980s to support MIT's Project Athena. Over time, the network gradually expanded, and in the early 1990s it connected the student residences through the Resnet program, which is now a standard offering in all new construction at MIT.

The existing telephone closets and newly created TDCRs (telephony and data communication rooms) function as installation points for network and telephony equipment to serve MIT's wired, wireless, and telephony infrastructure and to support its broad range of converged Internet Protocol (IP) services, including MITvoip. As the technology and devices supporting the campus network developed and matured, they began to push the limits of the infrastructure and reveal the need for higher category cabling, larger TDCRs, and additional power and cooling.

At the turn of the century, MIT made a strong commitment and financial investment to upgrade MITnet with a focus on wireless technology and converged IP services. MIT went "unwired" in 2004–05 when

Information Services and Technology installed over 3,000 wireless access points, making the MIT campus one of the largest geographic entities—about 11 million GSF—served by a single wireless network. MIT is currently upgrading the wireless network to the current generation (802.11n), which will provide network speeds of up to 150 megabytes per second. The Institute is targeting a two-thirds replacement, or 2,200 access points, by June 2009 and a full replacement by spring 2010.

The new MIT Regional Optical Network

In March 2008, the Insitute launched the MIT Regional Optical Network, one of the world's largest institutional networks for research and collaboration. Through this all-optical, next-generation network, MIT provides connectivity to key Internet exchange points with speeds beyond 10 gigabytes per second, the equivalent of transmitting 10 full-length, high-definition movies in 30 seconds.

IS&T partnered with Nortel to create the MIT Regional Optical Network, acquiring already-laid fiber-optic lines ("dark fiber") from Level-3 Communications. The network is designed to accommodate faster technologies and upgrades as they become available. Initially, it is being deployed across the northeastern United States, connecting MIT's main campus to New York, Washington, DC, and Baltimore via 1,500 miles of fiber, with optical equipment at 17 locations across seven states. Plans include linking to LHCnet, the research network maintained by the European Organization for Nuclear Research (CERN); the Energy Sciences Network (ESnet); and the National LambdaRail. All are composed of millions of network elements.

Athena clusters

IS&T provides and manages 17 general-purpose rooms historically called "Athena clusters," consisting of over 400 UNIX workstations throughout campus. More than 20 additional Athena clusters with over 500 workstations are managed by MIT's academic departments, laboratories, and centers.

A faculty committee that reviewed the use of these rooms reported that use varies, depending on the time of year and location. There is a perception that students take advantage of Athena clusters primarily for printing and e-mail access. Better data are needed to confirm this and to determine whether the rooms are still necessary in an environment where students increasingly have their own personal computers. For the time being, while the Athena clusters remain in service, the faculty review committee recommended enhancing their printing capabilities with a focus on resource conservation and ease of use. The committee also recommended equipping these workspaces with additional technology to support more flexible and collaborative interactions and learning.

Portions of three Athena clusters were renovated in 2006 to give students the option of using their laptops instead of the desktop machines provided. These renovated workspaces have wireless access; large, wall-mounted LCD display monitors, whiteboard/projection systems with electronic capturing, and modular and soft furniture.

IX. PROJECTIONS

Since the fall of 2007, the Institute has been engaged in an integrated campus-planning effort that will result in a comprehensive plan to optimize the Institute's land and building resources and provide a roadmap for decision making that balances programmatic initiatives with facility and open-space needs on campus. Progress on these fronts will lay the foundation for MIT's next capital development program.

The planning effort involves several steps: determining academic and student-life priorities; translating those priorities into proposals for renovation projects or potential new buildings; assessing MIT's building and land resources; and identifying infrastructure upgrades required to support campus development, such as upgrades to utilities, landscaping, parking, and information technology. The Institute aims to increase the value of its land and building resources by strategically locating programs in

both new and existing buildings. In particular, MIT is creating opportunities for the potential match of Institute priorities within existing buildings, with a benefit of addressing the Institute's backlog of deferred-maintenance projects. These considerations about building renovation are being included in a larger strategic plan for capital investment in MIT's buildings, which aims to balance renovations with building renewal and ongoing operations.

The Green Center for Physics, designed with the goal of fostering new research collaborations, was the cornerstone of a major infrastructure renewal and modernization project that has reinvigorated one-quarter of the original Main Group buildings and added 50,000 GSF of new space. Because of this project's success, MIT plans to continue the renewal of its historic buildings through renovation. We are also evaluating the benefits of future infill construction and other strategies to add facilities that support MIT's cutting-edge research.

All of these campus-planning efforts are being closely coordinated with the work of the Institute-wide Planning Task Force (described in Chapter 2), which has been examining many issues related to MIT's physical space and information-technology resources. Task Force working groups, made up of students, faculty, and staff, are charged with finding ways to reduce costs, increase efficiency, and improve effectiveness throughout the Institute. The groups focusing on physical resources are seeking savings in construction, renovation, and operating costs, along with opportunities to optimize the use of space. On the IT side, subgroups have focused on three broad areas of use: administration, education, and research. In addition, a separate cross-cutting subgroup has focused on possible organizational changes in the use of IT. A series of preliminary recommendations was made this summer, and can be found in the preliminary report of the Task Force in Appendix 6.

I. FINANCIAL MANAGEMENT AND OVERSIGHT
II. FINANCIAL OPERATIONS AND CONTROL
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III. STRENGTH OF THE INSTITUTE'S FINANCIAL POSITION
The endowment and other invested assets
Fundraising
Sponsored research
Debt structure
Financial framework, operating performance, and financial flexibility
IV. PROJECTIONS

MIT maintains strong and active oversight of its financial resources from top to bottom. Since the last accreditation, MIT's financial resources have improved significantly, thanks to successful fundraising and endowment performance and strategic management. A financial framework was created to strengthen financial-planning capabilities and to focus the use of these resources through an integrated prioritization of initiatives. Financial resource-development and allocation efforts preceded the dramatic downturns in the financial markets in late 2008 and 2009, cushioning the shock that MIT faced and positioning us to adapt to a period of economic uncertainty and reduced resources in a thoughtful and strategic way.

I. FINANCIAL MANAGEMENT AND OVERSIGHT

The MIT Corporation holds a public trust to assure that the Institute's financial resources are preserved for future generations as well as for current purposes. The Executive Committee of the Corporation serves as the Finance Committee. In 2006, MIT restructured the responsibilities of the executive vice president (EVP) to include the responsibilities of chief financial officer, and the EVP's title was changed to executive vice president and treasurer. Previously, the treasurer's duties were included in the role of the chief investment officer, who is now designated as president of Massachusetts Institute of Technology Investment Management Company. The EVP and treasurer is the officer of the Corporation responsible for stewardship of the Corporation's financial resources. The EVP and treasurer serves as an ex officio member of the Executive Committee and reports on the financial condition of the Institute to the full Corporation at its annual meeting, or more often if requested by the Executive Committee or if deemed appropriate.

In July 2007, financial planning, analysis, reporting, and operations were consolidated under the vice president for finance. This provided an integrated and expanded financial leadership role to support the EVP and treasurer and to serve the Institute's academic and research leadership.

In 2004, the Executive Committee authorized the formation of the MIT Investment Management Company (MITIMCo), which is devoted solely to managing the Institute's investment activities. The Executive Committee appoints the members of the Investment Management Company board, which meets four times a year to review investment policy and results. The president of MITIMCo reports to both the president of MIT and to the Investment Management Company board. The chairman of the Investment Management Company board is an ex officio member of the Executive Committee, and the EVP and treasurer is an ex officio member of the Investment Management Company Board. The Executive Committee approves the annual allocation from the endowment to the operating budget.

The EVP and treasurer is responsible for financial-strategy development, operations and capital-budget planning, debt issuance, and the integrity of financial reporting. Resource allocations are decided within the context of the financial framework, which was the result of a multiyear collaboration with the provost. As the chief budget officer and chief academic officer of the Institute, the provost is responsible for MIT's budget and planning, as well as for academic programs and activities. The Office of the Vice President for Finance supports the provost in his role of chief budget officer. Competing funding priorities include faculty, student, and research initiatives, as well as strategic buildings, capital renewal, and infrastructure. The annual operating budget, including $572 million at Lincoln Laboratory, is $2.4 billion in fiscal year 2009. The budget process is explained in Chapter 2, "Planning and Evaluation."

The provost is responsible for leading the educational and research programs at MIT, with the advice of the president and in concert with the chancellor and the academic deans. (As Chapter 2 explains, the annual budget allocations are based on school and Institute priorities and available resources.) The EVP and treasurer ensures that the Institute's financial, capital, and operational resources are optimally deployed in a manner that supports the Institute's academic mission of education and research.

The Building Committee, chaired by the EVP and treasurer and including the chairman of the Corporation, the president, the provost, the chancellor, and other senior officers including the dean of architecture, reviews proposals for major capital projects before submitting final recommendations to the Executive Committee for approval. The Building Committee also monitors the progress of construction activities.

During the academic year, the Executive Committee meets monthly to focus on the policy and administrative issues facing the Institute. It considers the Institute's strategic direction as well as the management and enhancement of financial and human resources. Comprehensive financial briefing materials are distributed to members. The Executive Committee approves the financial plan and annual operating budget, capital projects, and debt levels, as well as tuition rates and student financial aid policies.

II. FINANCIAL OPERATIONS AND CONTROL

The Institute has made significant investments to ensure that strong financial and control systems are in place, and it employs a committed and experienced team of financial and accounting professionals. A central finance team establishes accounting and control policies and procedures, which are largely executed in the departments, laboratories, and centers.

The Systems Applications and Products (SAP) general ledger system enables accurate and timely accounting for the Institute, including over 3,000 endowment funds. A standard quarterly Generally Accepted Accounting Principles (GAAP) reporting format was created and adopted for quarterly budget and financial reports, as well as for the GAAP exhibits since FY 2003. Using SAP and GAAP gives us an earlier and deeper understanding of the Institute's financial position and unit results, a more standardized closing process, and an alignment of financial information for senior management, the Audit Committee, and the Executive Committee. The SAP payroll system was brought online in 2006.

The Budget and Finance Steering Group (BFSG) conducts regular and systematic reviews of financial and budget results before distributing them to the Executive and Audit Committees. This group also facilitates communication and collaboration on cross-functional financial issues. BFSG members include the leaders of key finance and budget functions. The BFSG is cochaired quarterly by the EVP and treasurer and the provost, and during off-quarter months by the vice president for finance.

Internal auditing is an integral part of MIT's control structure, both on campus and at Lincoln Laboratory. Auditing provides reasonable assurance to management and the Corporation that Institute policies are being

adhered to as intended, that adequate internal controls are being maintained, and that assets are properly safeguarded. The internal audit program includes the review of control activities executed within the departments, labs, and centers. Potential audit areas are identified via management and risk assessment. The MIT Audit Division is responsive to requests for targeted services, including investigations into potential frauds or misappropriations.

PricewaterhouseCoopers (PwC) audits the Institute's financial statements. The Institute has received unqualified, or "clean," opinions from PwC on all of the annual financial statements it has issued since the last accreditation report. The Office of Naval Research is the recognized federal audit agency for MIT. To meet federal requirements under Circular A-133 for an annual audit of federally funded research awards, MIT employs a coordinated audit approach that combines work performed by PwC, an internal auditor, and the Defense Contract Audit Agency.

The Audit Committee of the Corporation meets three times each year. It reports annually to the full Corporation after the audit of MIT's financial statements.

Support to the DLCs and senior management

The Office of the Vice President of Finance (VPF) encompasses, among other units, the Office of Budget, Finance, and Treasury; the Controller and Accounting Services ; and Sourcing, which includes Procurement, Travel, and HR/Payroll. The VPF website provides policies and procedures, forms, resources, and reports to users. In addition, VPF actively engages with the departments, labs, and centers to streamline processes, improve the quality of data available to the Institute, promote compliance with Institute policies and procedures, and support the DLCs' use of the Institute's financial systems to better manage their financial resources. As part of these efforts, a number of training programs are offered regularly, including sessions on the Institute's financial architecture and its financial systems and processes. About every six weeks, training is offered to new and existing DLC staff on key financial processes. These include procurement, accounts payable, travel, cost transfers, use of the Institute procurement credit card, and "Financial Review and Control"—the Institute process for verifying that financial transactions have been posted completely, accurately, and in compliance with sponsor rules.

A recent addition to the training programs for DLCs is the Specialized Training for Administrators of Research "STAR WEB" program, a Web-based self-study program coordinated by the Office of Sponsored Programs. This program focuses on federal regulations and Institute processes for research administration. Since it became available in 2007, more than 600 users have completed the program modules relevant to their responsibilities.

VPF also supports the provost and other senior management with fact-based analysis, assists in decision-making processes, and models the drivers of the Institute's financial position.

III. STRENGTH OF THE INSTITUTE'S FINANCIAL POSITION

At MIT, the missions of education and research are connected and complementary. Approximately two-thirds of the Institute's 1,000 or so faculty members hold appointments in the School of Science or the School of Engineering. The vast majority of MIT undergraduates—nearly 85 percent—specialize in these fields as well. MIT provides these students with lab- and mentor-based education . From the start of their college careers, many MIT students engage in hands-on research, side by side with faculty. This is an inherently expensive process. For example, a lab staffed by expert technicians and equipped with a high-throughput screening device for genomic research indisputably costs more than a lecture hall or seminar classroom.

From 1999 to 2008, operating expenses increased $1 billion, or 77 percent. Operating costs have been rising at a significantly higher rate than the consumer price index because of the rapidly escalating cost of advanced science and engineering department facilities. As with other universities, a very high percentage of MIT's operating costs are fixed costs for education and research. Without great care, such fixed costs cannot be cut significantly without damaging the Institute's ability to perform breakthrough research and provide hands-on, lab-based, apprenticeship-style education.

For more than four decades, MIT has proudly practiced "need-blind" admissions, meaning that the Institute admits all undergraduates based on their academic merit alone, without considering their ability to pay. As discussed in Chapter 6, the Institute does not award academic, athletic, or any other form of merit scholarships. All student aid is need-based and meets the full demonstrated needs of students. The Institute has been able to support increases in financial aid that exceed tuition growth. This enables MIT to continue its commitment to ensuring access for qualified students regardless of their family resources. Roughly 13 percent of the endowment's value consists of endowed funds that donors restricted for undergraduate financial aid; this is the second-largest category after professorships. Over the last 10 years, these funds provided an average of 71 percent of MIT's undergraduate financial-aid expenditures.

MIT has seen significant increases in its overall financial resources since its last accreditation, due to growth in the investment markets and extensive fundraising campaigns. MIT's fiscal year is July 1 through June 30. Total net assets were $12.8 billion at year-end 2008 (the latest date for which audited numbers are currently available). The market value of the endowment was $10.1 billion as of June 30, 2008, up $5.3 billion—or 135 percent—since June 30, 1999. These increases have supported an expansive capital investment program that added about 2 million GSF to the campus and renovated over 1 million GSF over the past decade. The Institute is currently completing about $800 million of campus development and renewal and renovation projects (see Chapter 8 for more details). These resources also enabled the deployment of new software and networking enhancements Institute-wide to support MIT's mission and activities.

Gifts and support from investments have become an increasingly large part of overall revenues, increasing from 18.3 percent in FY 1999, to 23.4 percent in FY 2008. Tuition, net of financial aid, was 14.0 percent of overall revenues in FY 1999, compared with 15.6 percent in FY 2008.

For FY 2008, direct costs covered by research grants represented $1,039 million of the Institute's $2.4 billion consolidated revenues of which $448 million is campus research revenue. Indirect cost recovery on grants was $206 million. Direct and Indirect research revenues accounted for 57.0 percent of overall revenues in FY 1999 and 51.5 percent in FY 2008.

The endowment and other invested assets

As of June 30, 2008, MIT had the sixth-largest university endowment in the nation, reaching a total of $10.1 billion. The purpose of endowment is to provide a level of revenue stability for current and future generations of MIT faculty, staff, and students. For the past 10 years, MIT's endowment has returned, on average, 13.2 percent per year. In February 2008, the Executive Committee approved a new endowment payout rule. The new methodology was designed to provide a more sustainable pattern of support. In FY 2009, budgeted support from investments, including endowment, increased 34 percent, to $600 million.

However, MIT is not immune from the effects of the current economic downturn. We estimate that between June 30 and December 31, 2008, the market value of our endowment declined by about 25 percent, or $2.5 billion. In these challenging times, MITIMCo's success in managing the stability and growth of the endowment will be crucial to the future of the Institute.

Fundraising

The philanthropic generosity of individuals, corporations, and foundations has been a key element in MIT's rise to world leadership in education and research. Between 1998 and 2005, the Institute successfully raised $2.05 billion in the Campaign for MIT, exceeding both its original $1.5 billion target and its revised $2 billion target. Nearly 68,000 donors, including more than 50 percent of the alumni/ae community, participated. This was not only the largest capital campaign in MIT history, but also one of the largest in the history of higher education. It represented a stunning increase from the previous fundraising effort, the Campaign for the Future from 1987 to 1992, which raised $700 million.

MIT's donor base has become similar to that of its Ivy League peers. In the Campaign for MIT, the Institute achieved a record 66 percent of funds from individual donors. In previous campaigns, from 1987 to 1992 and from 1975 to 1980, only 42 percent and 37 percent, respectively, of contributions came from individuals.

Record levels of new gifts and pledges were achieved in fiscal years 2006 through 2008. New gifts and pledges in FY 2008 totaled $436 million, 27 percent more than in the previous year, which in turn was 25 percent higher than the year before. Fundraising accounts for 35 percent of funding sources for major new building projects, up from less than 20 percent in 2000. Although cash receipts have remained steady in the wake of the world's economic crisis, like many peer institutions we have witnessed a decline in new gifts and pledges.

In 2008, the Campaign for Students was launched with a goal of raising $500 million over five years for scholarships, fellowships, programmatic and capital investment in student life, and various faculty initiatives. As of June 30, 2009, approximately $350 million had been raised.

In 2008 the Office of Resource Development and the MIT Alumni Association were relocated from seven different buildings on campus to a newly renovated building at the western end of campus. Co-location of the two organizations has provided many more opportunities to collaborate and work together for the benefit of MIT, its alumni, donors, and students.

Sponsored research

As earlier chapters make clear, MIT has historically viewed teaching and research as inseparable parts of its academic mission. Research accounts for over half of MIT's operating budget. Research revenues totaled $1.2 billion during FY 2008, with Lincoln Laboratory accounting for about half of that sum. Total research volume includes all costs billed to research grants and contracts, both direct and indirect.

As described in Chapter 2, the Institute is highly focused on interdisciplinary research. The vice president for research (VPR) has overall responsibility for research administration and policy at the Institute. He or she oversees more than a dozen interdisciplinary labs and centers, including the MIT Lincoln Laboratory, the Plasma Science and Fusion Center, the Research Lab of Electronics, the Singapore-MIT Alliance for Research and Technology, the Francis Bitter Magnet Laboratory, Haystack Observatory, and the Division of Health Science and Technology. The VPR is responsible for research compliance and integrity and plays a central role in research relationships with the federal government, industry, foundations, and international sponsors. The VPR chairs the Research Council and the Committee on Intellectual Property.

The total population of graduate students and postdocs is highly correlated to the level of funding for campus research, as Chapter 4 notes. The sources of research funding are diversified and generally strong, showing a compound annual growth rate of 6.1 percent from 1999 to 2008.[38] The U.S. government provided 75 percent of campus research funding in FY 2008. The largest sources of government funding were Health and Human Services (35 percent—roughly double what it was 10 years ago), the Department of Defense (14 percent), the Department of Energy (10 percent), and the National Science Foundation (10 percent). Although federal sources continue to dominate research funding, private funding from industrial sources, foundations, and

[38] Please see Brown Book Schedule III – Expenditures by Sponsor, in the accreditation team room.

other nonprofit organizations has grown, accounting for 20 percent of MIT's research funding in FY 2008. We expect that this trend will continue. For example, the MIT Energy Initiative has attracted over $200 million from 32 industrial or public (nonfederal) sponsors.

New research models are emerging, and the research landscape is increasingly global. This is discussed more completely in Chapter 2, in the section on "Global Engagement." One example of an international research collaboration is the Singapore-MIT Alliance for Research and Technology (SMART) Center, a major research enterprise in Singapore established by MIT and the National Research Foundation of Singapore. The Smart Center began operating in FY 2008. It brings MIT faculty, researchers, and graduate students together with academic and industry researchers from across Asia to collaborate in exciting new areas of science and technology. Another successful research collaboration is the Broad Institute, formed in 2004 by MIT and Harvard, and affiliated with the 17 Harvard-affiliated teaching hospitals as a joint effort to conduct biomedical research. Broad became a separate, but affiliated entity as of July 1, 2009.

Debt structure

As of June 30, 2009, the Institute had $1.7 billion of outstanding debt. The Institute is one of only a small number of private research universities whose bonds are rated AAA.

Financial framework, operating performance, and financial flexibility

MIT gained more financial flexibility in fiscal year 2008 through a collaborative effort involving departments, labs, centers, and the Office of the Provost. Where permitted and appropriate, DLCs substituted increased restricted endowment distribution for general Institute budget (GIB) funds. Known as "rebalancing," this effort provided a larger-than-normal increase in the endowment distribution rate, in exchange for a generally equivalent reduction in general budget allocations. This effort also created a solid platform for the future, demonstrated by the fact that 92 percent (or $70.7 million) of departmental funds were successfully exchanged for GIB allocations.

Financial flexibility was further enhanced by incorporating an approach that puts a premium on future flexibility. A closer and more strategic look at the role of debt and liability management in the overall financial picture of the Institute resulted in the introduction of a capital-structure framework in May 2008. This new financial framework was designed to optimize the use of financial leverage and also balance operational risk, maintain the highest credit rating, and minimize the long-term average cost of capital.

As part of the financial framework, a base-case financial plan was developed to guide the FY 2009 and future budgets. This base case includes a balanced budget, $23 million for future financial flexibility, and a 1 percent general operating contingency reserve, or $12 million. It also includes funding for specific initiatives approved by the provost—such as faculty salary adjustments and mortgages, enhancements to undergraduate financial aid, and an increase in the tuition subsidy for research assistants—as well as additional funding to increase staffing in resource development and alumni/ae relations.

The financial framework is designed to be transparent, with support for operations growing in line with inflation. Key risks to the base case include endowment returns, economic conditions, inflation, competition, and changes in the Institute's ability to recover the indirect costs of research from federal sponsors. Sensitivities are modeled from the base case to measure the impact of these key risks.

Recent performance of the endowment has led to substantial analysis and planning for operating with reduced endowment support as explained in the section on Projections below and in Chapter 2, "Planning and Evaluation."

IV. PROJECTIONS

The global economic contraction in 2008–09 likely will compromise all the Institute's major revenue streams: endowment, tuition, gifts, and research. Market declines have affected even the most diversified portfolios, including MIT's investments, which will reduce endowment funds available to support the Institute's operations. As already mentioned, MIT estimates that the endowment declined in value by approximately 25 percent from June 30 to December 31, 2008. Currently, only research revenues are growing. The Institute is planning for a protracted period of financial constraint, while at the same time preparing for a future in which the economy may improve or worsen.

Taking these factors into account—the likelihood of revenue reductions coupled with uncertainty about the future—MIT anticipates the need to decrease spending by about 10–15 percent over the next two to three years. Achieving a base budget reduction of this magnitude requires a careful multiyear implementation plan, beginning with a number of practical short-term actions. Together, all departments across the Institute are designing new operating strategies that draw on more limited financial resources without sacrificing MIT's values or compromising its mission of world-changing education, research, and service.

The financial flexibility that was built into the 2009 operating budget allowed the Institute to take a measured approach to the radically altered economic climate. MIT was not forced into making immediate midcourse operating-budget adjustments in FY 2009. This allowed time for departments to carefully review their resources and plan accordingly for FY 2010 and beyond.

MIT's organizational structure encourages collaborative and strategic thinking about financial needs and resources. To support the completion of three major construction projects, the Institute secured $275 million of financing in December 2008, a month before Moody's issued a negative outlook on the U.S. higher-education sector. Renovation plans for an undergraduate dorm were scaled back to a level that was supported solely by donor funding and that focused on core infrastructure needs.

The EVP and treasurer and the president of MITIMCo provided leadership and focus to enhance liquidity management through the careful analysis and forecasting of cash flows, an area of critical importance following the economic shocks in 2008. After doing extensive financial modeling, MIT decided that it needed to reduce the $1 billion general Institute budget by $150 million (15 percent) within two or three years. The provost, the EVP and treasurer, and the vice president for finance concluded that for the short term, the FY 2010 budget would be reduced by $50 million across all units, and decisions would be made locally as to which line items would be reduced. This budget includes modest merit pool increases and a flat endowment payout with FY 2009. Recognizing that downsizing everything equally would not be in the Institute's best interests, MIT asked academic units, in aggregate, to reduce their base budgets by 3 percent, while asking administrative units, in aggregate, to reduce by 7 percent. Thanks to extraordinary work in every MIT unit, a 5 percent budget reduction has been achieved for FY 2010, which began July 1, 2009. For additional details, see the Fiscal 2010 Budget Book in the accreditation team room.

Longer-term budget reductions require a more strategic and thoughtful approach. To achieve an additional $50–$100 million budget reduction for FY 2011 and beyond, an Institute-wide Planning Task Force (described in Chapter 2) was launched in February 2009. A preliminary report, found in Appendix 6, was released to the community in August 2009 as our accreditation self-study neared completion. An fall 2009 deadline for the Task Force's final report was set to coincide with the beginning of the FY 2011 budget-planning process. We expect a subset of the working groups will meet periodically beyond October 2009 to review the implementation status of approved recommendations and to provide feedback to senior leadership. MIT is confident that this approach will generate the best ideas to help the Institute adapt to reduced financial resources while preserving and improving its core activities.

At least two changes that have budgetary implications are already clear. First, as noted earlier, the Broad Institute became a separate organization effective July 1, 2009. As a result, MIT's operating costs and

revenues will both decrease: direct research costs will drop $104.8 million—the amount MIT budgeted for the Broad Institute in FY 2009—and the general budget facilities and administration revenue will decrease $49.8 million.

Second, the American Recovery and Reinvestment Act of 2009 calls for the federal government to invest approximately $22 billion in extramural research between now and September 2010 for the purpose of stimulating the American economy through job creation and retention. MIT is taking part in this expanded research program.

I. CENTRALITY OF THE WEB
II. ONLINE INNOVATIONS
Enhanced outreach
Paperless publishing
III. QUALITY ASSURANCE
IV. MEASURING EFFECTIVENESS
V. PROJECTIONS

In the domain of public disclosure, MIT's passage into the digital era has been guided by long-standing commitments to openness, accessibility, and community. Over the past 15 years, the availability of an inexpensive, interactive, and hyperlinked communication medium has forever altered traditional publishing—no less for universities than for other organizations.

I. CENTRALITY OF THE WEB

In 2005, acknowledging the impact of the World Wide Web, NEASC's Commission on Institutions of Higher Education added a new criterion to the accreditation standard for public disclosure. Paragraph 10.1 seeks to ensure that (1) "the information published by the institution on its website is sufficient to allow students and prospective students to make informed decisions about their education," and (2) "the institution's website includes [all] the information specified elsewhere in this Standard (10.2–10.13)."

Today, at MIT, nearly every academic and institutional department, program, office, center, and lab boasts its own website. More than 1,118,000 documents are hosted on MIT Web servers, responding to millions of hits daily from all over the world. Amid this flood, MIT has sought not only to continually improve the quality of its online communications, but also to leverage the unique opportunities presented by the Web.

OpenCourseWare (OCW), MIT's pioneering experiment in the open sharing of knowledge, is perhaps the most dramatic example. In just five years, beginning in 2002, core teaching materials—syllabi, lecture notes, assignments, and exams—from virtually the entire MIT curriculum (more than 1,800 courses in 33 academic disciplines) were published on the Web and made available to a worldwide audience free of charge. Since OCW's launch, more than 53 million people—61 percent of them outside the United States—have accessed these materials. MIT has also encouraged the development of translation sites (into Chinese, Spanish, Portuguese, Persian, and Thai, among other languages) and provided more than 220 local copies of the OCW site to universities in bandwidth-constrained regions such as sub-Saharan Africa. In addition, the OCW example has sparked a global movement that today includes more than 250 universities around the world that together have published over 7,800 courses.

Within MIT, the proliferation of organizational websites has meant that anyone looking for the critical institutional information identified in paragraphs 10.2–10.13 of NEASC's public-disclosure standard can find it on a number of different sites. Appendices 5A and 5B provide the most relevant Web addresses. In keeping with NEASC standards, the Institute publicized opportunity for third-party comment through its homepage, news site, and accreditation website.

Overall, the trend at MIT over the past 10 years has been (1) for core print publications to develop online counterparts; (2) for the success of those online publications to result in the scaling back of some of the

original print publications; and (3) for new digital resources to be created for exclusive publication on the Web. MIT's student handbook (http://web.mit.edu/mindandhandbook), the IAP guide, listing the credit and noncredit offerings during MIT's Independent Activities Period (http://web.mit.edu/iap), and the annual *Reports to the President* (http://web.mit.edu/annualreports) are examples of former print publications that now reside exclusively on the Web. Examples of born-digital electronic publications include the MIT Organization Chart (http://web.mit.edu/orgchart), which introduces MIT's senior administrative officers to their constituencies and the public, and MIT OpenCourseWare.

In 2007, a communications survey of the MIT community drew responses from 3,506 students (36 percent of the student body), 3,706 staff (45 percent of the staff), 336 faculty members (34 percent of the faculty), 1,414 Lincoln Lab employees (55 percent of the employees), and 2,918 alumni (37 percent of those invited to participate). Based on the survey results, Institute communications can be characterized as good, but there is significant room for improvement. Two-thirds (67 percent) of all respondents said they were either very or somewhat satisfied with MIT's efforts to keep them informed about the Institute. However, the information sources used to stay informed about MIT varied across the community, with MIT websites as the one common source used by all groups. There is broad agreement that the central MIT website should be improved and expanded so that it can be relied upon more in the future.

II. ONLINE INNOVATIONS

In MIT's 1999 accreditation evaluation, the MIT website was criticized (albeit mildly) for not rising to the excellence expected from MIT as the supposed "center of the digital universe." Although the website was judged "adequate," the evaluation team found that its "components vary in format, design, content, presentation completeness, and quality. It is easy for outsiders to get lost."[39] In response, MIT promised to redesign the website as necessary to make it an effective source of information about the Institute and its programs. In 2002–03, a substantial redesign of the MIT homepage, together with some 275 secondary pages, began to fulfill this promise.

Driving the new design was a commitment to usability, community, and open communication. The site managers invited all viewers to submit images for the homepage, calling it an "open-source design" that celebrates the creativity and diversity of our community. Site usability was substantially improved by the installation of a new search engine, built by Google, that continually indexes the entire MIT domain (mit.edu) containing well over a million Web pages, PDF documents, Word documents, and Powerpoint slides. (Images are not indexed, as yet.) The result is a direct path to the content of MIT's many websites, letting users quickly bring up recondite documents, such as the MIT treasurer's report with the Institute's audited financial statements, or comb particular corpuses, such as MIT's annual reports from 1911 to the present, for keywords or special terms of interest—a boon to historians.

Respondents to the 2007 communications survey saw the MIT homepage as "the most valuable MIT online resource," with 47 percent of faculty members, 44 percent of staff, and 28 percent of students adopting it as the default homepage of their Web browser. (The alumni considered the Alumni Association website to be equally valuable.) But as expected, there were suggestions for improvements, including making the homepage more intuitive and visually appealing and improving the search function. Survey respondents, especially students, also indicated substantial interest in new communication technologies such as audio and video podcasting and blogs.

[39] *Report of the NEASC 1999 Evaluation Team* (available at http://web.mit.edu/accreditation/archive/1999/evaluation.html).

Enhanced outreach

The MIT website is actually an interlinked domain containing hundreds of individual websites, some of them centrally administered. While the open culture celebrated at MIT has produced OpenCourseWare, MIT has also led the way in using Web tools to enhance outreach in other areas as well. Personalizing the admissions process has been one of the most successful. Today, prospective students are invited to register at the MyMIT website (http://my.mit.edu), where they can apply for admission online. They also are welcomed to the MIT Admissions Web portal (http://www.mitadmissions.org), featuring an array of blogs written by admissions and financial-aid staff members (including the financial aid director), as well as by current MIT students. Begun in 2004–05, the admissions blogs illuminate the admissions process from the inside and give down-to-earth glimpses of what it's really like to live and study at MIT. The site's indexed archive of 2,900 blog entries by MIT students already rivals, if not surpasses, the traditional admissions viewbook (which MIT still prints and mails to some 45,000 high-school juniors each year). For prospective students, probably the most compelling aspect of the site is the opportunity to join a community centered on MIT and chime in—asking questions, commenting, and, most important, enjoying a personal communication with someone at MIT.

Another area of successful outreach is MIT World (http://mitworld.mit.edu), the home of lectures without walls. Begun in 2001 as a video-streaming website of primary interest to the MIT community, MIT World serves an increasingly global audience (more than 90 percent of whom are situated outside the MIT domain), providing them with on-demand access to public events at MIT. Currently, the site holds more than 625 lectures and panel discussions videotaped at MIT and featuring engineers, technologists, scientists, inventors, historians, economists, astronauts, environmentalists, writers, artists, architects, and visionaries and thought leaders, including 29 Nobel laureates. About 115–120 new lectures are added annually, contributing to the more than 1.2 million screenings requested each year by viewers around the world. The top 10 videos at MIT World are listed in Appendix 5; many MIT World videos are also available without charge through Apple's iTunes U.

Paperless publishing

In the past year, recent trends toward paperless publishing have accelerated at MIT because of a combination of factors—the wide acceptance of online technologies coupled with a critical need for budget reductions and environmental concerns. A growing number of MIT offices and programs are opting to publish their informational literature, such as newsletters, exclusively online. At the same time, print remains important for some offices, especially those with high levels of outreach activity, such as admissions, financial aid, and fundraising. In their experience, reference publications, such as a guide to the admissions process or a brochure describing student financial accounts, have a tangible concreteness in print that cannot be duplicated online—a value recognized by even the most wired. For offices like these, the perennial question remains how to achieve an appropriate mix of print and electronic publications in order to communicate effectively—and economically—with their diverse audiences. To explore these opportunities, MIT has convened advisory groups to evaluate communications programs on campus. Their work will include evaluating response metrics for print and Web to identify effectiveness while considering cost. In the months ahead, MIT will also explore technologies to streamline production and business processes related to the development and dissemination of communications.

III. QUALITY ASSURANCE

Another perennial question is how best to maintain the accuracy of the information that MIT publishes each year. The procedure followed at MIT combines a traditional approach with modern tools. Critical institutional information—from MIT's mission statement and accreditation information down to the exact wording of its nondiscrimination policy—is checked and updated annually by a network of administrative officers in offices and departments across campus, each with responsibility for particular sections of the *MIT Bulletin* and related texts, operating under the supervision of editorial staff in the Reference Publications and Registrar's offices. Error checking makes use of electronic revision-tracking tools but

ultimately relies on the paper-and-ink trail left on handwritten proofs—a precaution still regarded as indispensable for safeguarding the accuracy of MIT's official information.

Accuracy goes hand in hand with perceived quality, and improving the quality and effectiveness of MIT publications, both print and electronic, has long been an institutional priority. MIT's Publishing Services Bureau offers free consulting and procurement services to campus print and Web publishers, and additional Web design and development services (some of them fee-based), including a usability lab for website testing, are available from MIT's central IT department, Information Services and Technology. These groups encourage adherence to professional standards and are adept at helping MIT publishers meet those standards. Annually, they provide assistance to more than 1,200 print and Web publishing projects, about half the total number of such projects initiated each year at MIT.

IV. MEASURING EFFECTIVENESS

Individuals who have contact with MIT occasionally offer praise or criticism of Institute communications, either via e-mail or in conversations with Institute personnel. Such random comments have value, but they don't provide measurable data. Therefore, MIT conducts periodic surveys like the College Board's Admitted Student Questionnaire, the MIT Parent Survey, and exit surveys from MIT's annual Family Weekend. Findings from these surveys help MIT's Admissions and Financial Aid offices to evaluate the effectiveness of the information they send to students and parents and to gauge MIT's performance relative to that of its peers. Results from the most recent surveys are available for inspection in the accreditation team room.

Some evidence of the success of MIT's website also comes from standard Web metrics measuring traffic volume (the number of page views). Qualitative feedback from users is scarce, because most university webmasters are reluctant to install pop-up windows or other devices to solicit visitor participation in online surveys. However, a few large campus surveys have asked members of the MIT community about their online experiences. OpenCourseWare surveyed all undergraduates to understand how to improve the OCW website and make it a more valuable resource for the MIT community. And the 2007 communications survey helped MIT appreciate not only the importance of the Web as a trusted information source relied on by all segments of the community, but also the interest in new Web technologies for delivering content and building community.

V. PROJECTIONS

Management of the MIT homepage was transferred to the MIT News Office in 2007. To respond to the community's interest in new communication channels, the News Office embarked on a study of emerging technologies and social-networking media, with the aim of reengineering how MIT gathers and disseminates Institute news. A new MIT homepage and MIT News site with new functionality will be introduced in stages, beginning in September 2009. Meanwhile, rampant experimentation is under way with video-streaming sites (http://watch.mit.edu), podcasting (http://web.mit.edu/newsoffice/subscribe-podcasts.html), news feeds (http://web.mit.edu/newsoffice/subscribe-rss.html), blogs (http://blogs.mit.edu/CS/blogs/), and wikis (https://wikis.mit.edu/confluence/dashboard.action). These tools offer a path for communication that is increasingly bidirectional, interactive, and fine-grained. The challenge for MIT is to adapt its communications to this new information environment as a means of fulfilling its mission to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century.

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As a higher-education institution dedicated to advancing knowledge and educating students in science and technology, MIT and members of its community have a duty to one another, and to the world, to act with integrity. The Institute embraces this duty, which manifests itself in MIT's stated mission: "We seek to develop in each member of the MIT community the ability and passion to work wisely, creatively, and effectively for the betterment of humankind." MIT's commitment to integrity is evident in the Institute's governance, policies, and practices.

I. RESOURCES

Faculty and staff

The MIT Policies and Procedures website, nicknamed the "P&P," is considered the "go to" place for almost any policy question. Readily accessible, P&P is intended to guide members of the MIT community in their pursuit of Institute objectives. Its primary focus is on faculty and staff, but many of the policies apply to the entire Institute community. The accuracy and consistency of the information maintained on the site is of utmost importance. Periodically, the Office of the President reviews the site, sending policy to relevant offices or individuals for feedback. On an ongoing basis, the assistant deans of the five schools review, discuss, and revise various sections to reflect changes in policy or to address current circumstances. In 2009, the President's Office conducted a major review of many P&P policies and launched a redesigned website that makes P&P easier to search and navigate (http://web.mit.edu/policies/).

Given the dynamic nature of MIT's activities and forces external to the Institute, P&P does not, and cannot, address all potential issues of integrity. However, P&P does provide a framework of principles that supports the Institute's position on issues of integrity and that serves as a guide for the MIT community. P&P includes policies related to conflicts of interest, outside professional activities, gifts and gratuities, personal conduct, violence, racism, and health and safety. Its policies also cover harassment, complaints and grievances, academic misconduct, privacy and information disclosure, relations with the public, use of the MIT name, intellectual property, the Institute Archives, and research.

For additional guidance on issues of integrity, members of the MIT community may turn to other significant resources, such as:

- Procurement Policies and Procedures
- MIT EHS (Environmental Health and Safety) Policy
- The Technology Licensing Office's Guide to the Ownership, Distribution, and Commercial Development of MIT Intellectual Property
- The Office of Sponsored Programs' Guidelines for Financial Conflicts of Interest
- MIT Personnel Policy Manual
- *Fostering Academic Integrity* (report of the Committee on Academic Responsibility)
- The Ombuds Office website
- The Office of the General Counsel website
- Rules and Regulations of the Faculty

Students

MIT also emphasizes to students its expectations of integrity. The annual Courses Catalogue issue of the *MIT Bulletin* states:

> *MIT expects that all students come to the Institute for a serious academic purpose and expects them to be responsible individuals who conduct themselves with high standards of honesty and personal conduct . . . Fundamental to the principle of independent learning and professional growth is the requirement of honesty and integrity in conduct of one's academic and nonacademic life. Maintenance of a healthy living and learning environment requires that all members of the community exercise due respect for the basic rights of one another.*

The *MIT Bulletin* also directs students to individuals and groups on campus that can be supportive in the application of these principles. Other MIT publications—specifically, *Mind + Hand + Book* and the *Academic Integrity* handbook—are key tools for students navigating issues of academic integrity. *Mind + Hand + Book* is an online student handbook that is updated frequently. It delineates many of the topics identified above in the excerpt from the *MIT Bulletin* and organizes them in an intuitive way for students. The *Academic Integrity* handbook, also available online, presents important information relating to students' academic work. For example, it offers guidance on properly acknowledging sources, collaborating on assignments, and writing original code. Graduate students are also reminded of MIT's expectations of academic integrity through MIT's Graduate Policies and Procedures website. The website incorporates many of the resources listed above and supplements them with additional information directed at graduate students.

Ombuds Office

In addition to the offices that serve specific segments of the campus, the Ombuds Office is an independent, confidential, neutral resource for the whole, diverse MIT community—faculty, staff at all levels, students, and postdocs. In the Ombuds Office, every voice at MIT can receive impartial attention without fearing loss of privacy. Mirroring the diverse, cross-disciplinary, and international character of MIT, the Ombuds Office increasingly handles complex matters involving multiple issues and multiple cohorts. The Office helps people express concerns, resolve disputes, manage conflicts, and learn more productive ways of communicating. It also seeks to promote a fair conflict-management system and supports systemic changes to achieve this goal.

II. PROMOTING A CULTURE OF INTEGRITY

Governance

A commitment to integrity requires a transparent and inclusive process for making decisions and policies. To this end, MIT relies on over 30 committees appointed by the president and the Corporation to foster broad and transparent discussion on key policy areas. Committee members are held to high ethical standards in the management of MIT affairs and in their dealings with students, faculty, staff, the Institute's governing board, external agencies and organizations, and the general public. The vast majority

of these committees include representatives from the student, faculty, and staff populations. By federal mandate, the Institute has review boards on animal care and human subjects. Other committees focus on safety issues such environmental health and safety, biohazards, and radiation protection. Still other committees concentrate on specific priorities at MIT, promoting communication on topics such as race and diversity or on issues specific to support staff or female employees. In addition, faculty committees—such as the Committee on the Undergraduate Program and the Committee on the Graduate Program—often address issues related to integrity; most of the faculty committees include student representatives as well. A full list of committees and councils of the Institute can be found at http://web.mit.edu/committees/www.

As noted in Chapter 3, the Institute is governed under the terms of a charter granted by the Commonwealth of Massachusetts. The members of the Corporation are responsible for ensuring that the Institute is managed in conformance with the terms of its charter. It is the policy of the Institute that its officers, faculty, staff, and others acting on its behalf have the obligation to avoid ethical, legal, financial, or other conflicts of interest, and to ensure that their activities and interests do not conflict with their obligations to the Institute or with the welfare of the Institute.

Effective administration of this policy requires that disclosure of relevant outside professional activities, including financial interests that might give rise to conflicts, be disclosed to designated Institute officers. Members of the faculty and of the sponsored research and administrative staffs must report annually on their outside professional activities. The Executive Committee of the Corporation receives an annual report on outside activities of the faculty and staff. Similarly, all members of the Corporation make an annual conflict-of-interest report to the chairman of the Corporation, while the officers of the Corporation make an equivalent report to the chairman of the Salary Subcommittee of the Executive Committee, who is not a compensated employee of the Institute.

The Corporation also holds a public trust to assure that the Institute's financial resources are preserved for future generations as well as for current purposes. The financial oversight exercised by the Corporation and its Executive and Audit committees is detailed in Chapter 9.

Research

Fostering research and inquiry into intellectual areas of great promise is one of the most basic obligations MIT has to its faculty, to its students, and to society at large. Consequently, the Institute sees profound merit in a policy of open research and free interchange of information among scholars. At the same time, MIT is committed to acting responsibly and ethically in all its research activities. As a result, MIT has policies related to the suitability of research projects, research conduct, sources of support, use of human subjects, sponsored programs, relations with intelligence agencies, the acquisition of art and artifacts, the disposition of equipment, and collaborations with research-oriented industrial organizations. These policies are spelled out on the Policies and Procedures website and on the Office of Sponsored Programs website. Graduate students and postdoctoral students receive further education on ethical issues through their departments and as part of their training grants.

Although proud of its existing safeguards, MIT has recommitted itself to examine issues of integrity with added vigilance. In recent years, the complexity of the research enterprise has increased, particularly in the areas involving commercial sponsorship, technology transfer, and international engagement. Given this evolution, MIT has initiated a number of comprehensive reviews of its principles, policies, and procedures with the goal of preserving the highest standards of conduct among all those in its community.

In fall 2008, the provost, in consultation with the chair of the faculty, appointed an ad hoc faculty Committee on Managing Potential Conflicts of Interest in Research. The role of the committee is threefold: (1) to review the types of individual and institutional relationships that have the potential to give rise to actual or perceived conflicts of interest; (2) to assess applicable laws and regulations; and (3) to examine the Institute's written and practiced policies and procedures related to conflicts of interest and

compare them to those of other higher educational institutions. This committee is expected to recommend changes that will strengthen and clarify the Institute's policies and procedures; review mechanisms for monitoring and reporting conflicts of interest; and recommend programs for ongoing education and information exchange regarding research integrity and conflict of interest.

In a related move, the provost, in consultation with the chair of the faculty, appointed another ad hoc faculty committee, the Committee on Technology Transfer in the 21st Century. This group is exploring ways in which MIT's policies, procedures, and practices can enhance and accelerate technology transfer to contribute to the economy and welfare of the nation and the world. In addition to reviewing industrial partnerships and the principles on which they rest, the group will learn from practices at peer institutions. Then it will recommend appropriate changes to MIT's policies and procedures to enable the formation of beneficial, strategic partnerships with industry while preserving MIT's fundamental values and principles.

In recognition of the connection between the two studies, the Committee on Managing Potential Conflicts of Interest and the Committee on Technology Transfer in the 21st Century are coordinating with each other. Reports are expected from both groups in 2009-10. More information can be found in the accreditation team room and at http://web.mit.edu/provost/committees.html.

Student community

As part of our efforts to rethink and promote integrity among our students, in 2008 the Office of Student Mediation and Community Standards became the Office of Student Citizenship (OSC). The change was made not only to improve an awkward and somewhat confusing name, but also to reflect a philosophical shift toward investing students with the responsibility for developing and enforcing their own standards of conduct. OSC strives to help students become responsible, ethical members of the MIT community and the world at large. While OSC remains the gateway for formal disciplinary action against students, the office also seeks to be a place where students can come to work through concerns about values and integrity. With that goal in mind, OSC promotes collaboratively created community standards; community-based approaches to student intervention and education; and a process for enforcing community standards that is fair, easily accessible, transparent, and well publicized. While OSC encourages individuals to resolve conflicts by themselves, it also provides support to the Committee on Discipline (the faculty committee that adjudicates cases of student misconduct) and to various student judicial committees and mediation teams within the student residences.

As with most universities, students occasionally participate in behavior that is risky to themselves or to others, and they sometimes engage in academic dishonesty. If a student commits an act of academic misconduct, MIT's academic-integrity policy allows faculty almost complete discretion in handling the matter. A faculty member can take any action he or she feels is appropriate regarding the student's grade, including failing the student for that class. In addition, the faculty member can document the misconduct by having a letter placed in the student's file or by bringing a formal case to the Committee on Discipline. Documenting the misconduct reinforces the inappropriateness of the student's behavior and discourages repeated infractions. The Office of Student Citizenship is available to assist faculty in deciding how best to address these difficult situations.

In an October 2007 letter to the MIT community[40], the chancellor called on community members to sharpen their commitment to the Institute's core values and obligations. As one example, the chancellor cited integrity issues related to MIT students' practice of "hacking." A tradition at MIT, hacking is understood to be the design and execution of harmless pranks, tricks, and creative explorations that demonstrate ingenuity and cleverness. Although a strict "hacker's code" has always emphasized safety, responsibility, and accountability, in February 2008 MIT added new language to the student handbook to strengthen hackers' understanding of their responsibilities. The change to the handbook, developed over a

[40] Philip Clay, "*Student letter regarding hacking*" (letter, October 1, 2007: available at http://web.mit.edu/chancellor/letters/letter10012007.html).

number of months with the help of students, faculty, and administrators, serves as one example of how MIT works with students on disciplinary issues, and how the community works together to address concerns.

To ensure standards of integrity, MIT's individual schools have additional measures in place. For example, MIT Sloan's MBA program Professional Standards provides behavior guidelines for students, faculty, and staff inside and outside the classroom. The school's Student Senate began the MIT Sloan initiative in 2000. Professional Standards has recently been relaunched as Values@MIT Sloan. Focusing on core values such as integrity, respect, collaboration, innovation, and positive impact, the language was updated to better align with the school's mission statement to develop principled, innovative leaders. Value@MIT Sloan content is included in all syllabi, discussed at the beginning of every class, and encouraged in extracurricular activities.

IV. DIVERSITY AND INCLUSION

MIT is committed to ensuring equality of opportunity in education and employment at the Institute. Chapters 5 and 6 ("Faculty" and "Students") cover MIT's recruitment, retention, and support services for members of underrepresented groups. In addition to those initiatives, many others are under way.

The Committee on Race and Diversity is composed of students, faculty, and staff who seek to promote communication on issues of diversity and inclusion. This committee also organizes cultural activities such as the annual Martin Luther King Jr. Celebration.

Recognizing the pivotal role that employees play in fostering a culture of inclusion throughout the Institute, the Human Resources (HR) Department has developed goals for campuswide affirmative-action plans, reestablished the Staff Diversity Council (a presidential advisory group), and designated a manager of staff diversity. In addition to developing a new Staff Diversity website, HR is working to ensure that diversity is embedded in all leadership programs, and it is training staff on issues of bias inclusion and cultural competence.

These Institute-wide efforts are supplemented by diversity initiatives within schools, departments, and administrative units. For example, in 2007 the School of Architecture and Planning hired its first-ever manager of diversity recruiting. MIT Medical has a Diversity Steering Committee that publishes its own newsletter, sets up programs for diversity training, and organizes monthly discussions of issues related to inclusiveness. The chair of the Physics Department presented a plan to the department's faculty to draw more women and underrepresented minorities to MIT.

Reflecting MIT's increasing attention to these issues, the president and the provost have instituted an annual *Diversity Report to the Corporation* to monitor progress on diversity recruitment and retention of students, faculty, and staff. Building on these efforts, President Hockfield recently challenged the Institute to make serious and meaningful steps forward in its diversity and inclusion efforts. In 2008, she observed:

> *If this were any other kind of problem—an engineering problem, a scientific problem, an unsolved problem in mathematics or a problem of national defense—we would not be satisfied with well-intentioned but only incremental progress. … I believe MIT needs to commit itself to unprecedented, sustained, concrete action on diversity and inclusion. And I believe that the time to do it is now*."[41]

To that end, the president brought together more than 300 of MIT's academic, administrative, and student leaders for a Diversity Leadership Congress on November 18, 2008. Acknowledging that no one solution

[41] Susan Hockfield, "*Diversity and Inclusion: Building a Solution Worthy of MIT*" (speech, February 21, 2008: available at http://web.mit.edu/hockfield/speeches/2008-mlk-breakfast.html).

or approach will work for every department or school, she called upon the distributed leadership of the Institute to approach this challenge with a unified commitment to drive positive change.

Discussions from the Congress yielded over 1,000 written comments regarding current and future diversity and inclusion practices. Comments ranged from specific programming or policy suggestions to general reflections. Lessons learned from the Congress are being used to launch a new interactive website in fall 2009. In addition, several of MIT's diversity groups are examining the data and identifying models that work and that can be repurposed as tools to be used throughout the Institute. In spring 2009, MIT launched a dialogue series about unconscious bias and its unintended consequences. More than 75 faculty, staff, and students participated in the program, which stressed not only personal development, but also the development of professional and cultural-competency skills. Fittingly, given the need for collaborative approaches to diversity issues, the program was jointly sponsored by the Committee on Race and Diversity; the Council on Staff Diversity; the Student Activities Office; the Initiative on Faculty, Race, and Diversity; the Graduate Student Council; and the Undergraduate Association.

IV. PROJECTIONS

MIT will continue to maintain the highest ethical standards in its teaching, research, and administration, articulating its expectations for trustees, faculty, students, and staff in widely disseminated policy documents available in print and online. Policies and procedures will be revisited, renewed, and updated as appropriate to reflect the evolving needs of the community. As mentioned earlier, reports are expected in the next year from the faculty committees on Managing Potential Conflicts of Interest and MIT Technology Transfer in the 21st Century.

Another priority is strengthening our culture of inclusion. MIT strives to be a place that reaches out to, welcomes, and rewards the very best talent, no matter where that talent comes from. We succeed in our diversity only when all members of the community feel valued, included, and at ease— empowered to do their best work and fully contribute to our mission. MIT has unrelenting standards of excellence; we expect great things of our students, faculty, and staff. In return, we must offer them unfettered opportunities and strong support. If there are any barriers in our culture, we must identify what those are and make changes.

We also anticipate devoting more time and attention to integrity issues involving electronic media and communications. Given the growing role of technology in the lives of MIT students, the Institute has a special responsibility to present clear guidelines on the proper use of all copyrighted materials, particularly digital ones, and to disseminate information on the consequences of digital copyright infringement and unauthorized file sharing. Despite massive public-information campaigns and media coverage of the enforcement activities of the entertainment and software industries, some members of the MIT community are still unaware of the legal and disciplinary consequences of unauthorized file sharing. MIT will continue to inform both current and prospective students of their rights and responsibilities, in compliance with the evolving regulations related to the Higher Education Opportunity Act of 2008. We plan to provide information through the Student Financial Services website, the *Mind + Hand + Book* website, a planned revision of the *MIT Academic Integrity* handbook, and the general MIT copyright portal at http://web.mit.edu/copyright.