

MIT Faculty Newsletter

<http://web.mit.edu/fnl>

this issue includes an editorial on our new look (page 3), Faculty Chair Rafael Bras on the presidential selection process (page 5), observations on how to grade incomplete work (page 7), poems by two MIT professors (page 16), two contributions to our ongoing series on research at MIT (pages 17 and 19), two articles about LGBT at the Institute (pages 21 and 22), a piece on recent e-mail changes (page 24), our regular OpenCourseWare Update (page 26) and our M.I.T. Numbers feature devoted to faculty hiring since 1985.



Financing MIT

Robert A. Brown

“Wise and prudent men — intelligent conservatives — have long known that in a changing world worthy institutions can be conserved only by adjusting them to the changing time.”

— Franklin D. Roosevelt, September 1936

I AM WRITING THIS piece during the holiday break while reflecting on both the discussions and decisions over the past nine months that will set the stage for the MIT budget in Fiscal Year 2005 (July 1, 2004-June 30, 2005). Chancellor Phil Clay and I have met with almost all the academic units (we still have a few meetings scheduled in January and February) and in these sessions we have described in some detail the strategies that have been the basis for our decisions, our current financial situation, and the path forward. I know that some faculty members feel they have heard enough about these issues and want to look forward. However, it is an important exercise to understand MIT finances over the last decade and the decisions that have been made in order to extract the important lessons. I will attempt to do this in this short piece and, hopefully, help a greater number of faculty and staff understand the financing of MIT. Lastly, I hope that the presentation will enhance discussions about strategies going forward.

Before reviewing the details I want to make sure that the basic message does not get lost in the details. MIT is intellectually and financially strong. We have the people, money, and infrastructure to continue to be the most important research university in

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Vest to the Faculty

Charles M. Vest

The following are comments made by President Vest at the December 17th faculty meeting, in reference to the announcement of his plans to retire.

WHEN I FIRST SPOKE here in 10-250, it was July 1990, as I was being introduced to the MIT community as your new president. I knew that virtually not a soul in the room had the foggiest idea who I was, or what was about to happen. I went to the blackboard and – quoting from Pogo Possum – wrote what I imagined everyone in the room was wondering: “What hath got wrought?” Today, 13½ years later, I think we have some sense of that. I’d like to talk a bit about what hath got wrought in these intervening years, and make some personal comments on what the presidency of MIT has meant to me.

First of all, why have I decided to step down from this wonderful position? Shortly after I came here, I asked Paul Gray, “How is it you know when it’s time to step down as president?” He said, “That’s easy. You know it’s time to leave when they come around and suggest that you get your portrait painted.” But the fact of the matter is that I’ve been here over 13 years, and nobody’s come around offering to paint my portrait. About a year and a half ago, though, I began to hear that little, internal voice that we all have to pay attention to. That voice was saying things not so much about me, but about MIT. It began to tell me that the time was coming for the institution to go through the experience of renewal, reinvigoration, and reflection that comes through the process of finding, selecting, and bringing a new

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Subscriptions

\$15/year on-campus

\$20/year off-campus

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Editorial Our New Look

Editorial Committee

WELCOME TO THE NEW MIT Faculty Newsletter.

We hope that you find our makeover attractive and elegant, that you will read this and future issues with renewed interest, and most of all that you will join with us, your faculty colleagues, in making the new *Faculty Newsletter* more relevant, more concise and lively, more broadly engaging than ever before.

You can help the FNL in many ways: by volunteering to serve on the Editorial Board, by submitting an article or a query about a possible article, by suggesting topics or projects you think appropriate for a newsletter by and for the faculty of MIT.

In addition to a new look, the *Newsletter* has added a new continuing feature, MIT Poetry, and plans to introduce other new items in future issues.

The poets represented in this issue, Samuel J. Keyser and John Hildebidle, are widely known at the Institute for other distinguished achievements. As this issue of the FNL shows, they are also distinguished poets. After offering his poem for publication in this issue, Jay Keyser agreed to join David Thorburn as co-editor for poetry for the FNL. They welcome submissions from all sectors of the MIT faculty.

Reprint Feature

We hope to introduce a reprint page beginning in our next issue. This page will reprint excerpts or short complete pieces published by MIT faculty within the last six months. We welcome suggestions or submissions for this new feature, which will aim to reprint short pieces of fairly

wide general interest to our faculty. Specialized, scholarly pieces will not be appropriate, but interviews, op-ed pieces, guest columns, transcripts or summaries of congressional testimony, graduation speeches and the like are particularly welcome. Submissions for this feature must have genuine broad appeal to many

The *Newsletter* Editorial Board welcomes suggestions from colleagues for topics of central concern to MIT's professors and researchers, as well as the academy at large. . . . Our idea is to invite responses on such crucial topics from a range of colleagues and to publish them as occasional features in the *Newsletter*. Public lectures or forums might provide the incentive or topic statement for such a faculty roundtable.

on the MIT faculty. The Editorial Board of the FNL will share responsibility for judging submissions.

Faculty Roundtables

The *Newsletter* Editorial Board welcomes suggestions from colleagues for topics of central concern to MIT's professors and researchers, as well as the academy at large. Examples: research vs. teaching, the cost of higher education, tech support in teaching or research, retirement packages for faculty. Our idea is to invite responses on such crucial topics from a range of colleagues and to publish them as occasional features in the *Newsletter*. Public lectures or forums might provide the incentive or topic statement for such a faculty roundtable.

The Website

We are especially pleased to be able to

announce that the *Newsletter's* Website, <http://web.mit.edu/fnl>, has been extensively redesigned in concert with the makeover of our printed version, and with the assistance of Web consultants Jeff Reed and Margaret Wong of Information Services and Technology. The site will continue, as in the past, to

be available only to those with MIT Web certificates. But those using it will find it far more navigable than ever before, a genuine archive of the *Newsletter's* past. We also hope to develop some items that will play more extensively or differently on the Web, such as the article in our September issue by Peter Child, "Why Compose," about his musical compositions, a fragment of which can be played from a link in the online version of this story.

The Redesign

This redesign of the *Newsletter* was supervised by a committee composed of editorial board member David Thorburn, Managing Editor David Lewis, Nancy Kelly of the President's Office, and Cheryl Slowik of the Publishing Services Bureau...working with

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Our New Look
continued from page 3

Jan Moscovitz and Tim Moore of the Brookline design firm Moore Moscovitz.

A number of design possibilities were presented, from which a classic “swiss style,” with the strong use of a grid, was chosen. The use of white space and contrasting font weights and sizes helps to make the pages “cleaner” and more inviting to read, while at the same time maintaining a significant word count per page.

The headline font, Akzidenz Grotesk, designed by Günter Gerhard Lange in

1896, was chosen for its classic, no-frills aesthetic. In German, Akzidenz means trade type and Grotesk means sans serif. Before the advent of Helvetica and Univers, Akzidenz was the standard sans serif type in Switzerland. The main text font, Minion, designed by Robert Slimbach for Adobe, was selected for its legibility and the diversity of its fonts, including fractions, an important consideration for a publication of MIT. Although some of the great hot metal typefaces have not been well digitized for computer use, the Adobe digital versions of hot metal typefaces have been extremely well reviewed.

The *Newsletter* is produced by Managing Editor David Lewis on a Macintosh computer running QuarkXPress. It is printed on Domtar Solutions Super Smooth recycled white paper by Eagle Graphics Printers.

The *Faculty Newsletter* Editorial Board thanks the Office of the President for its generous financial and creative support of this redesign.

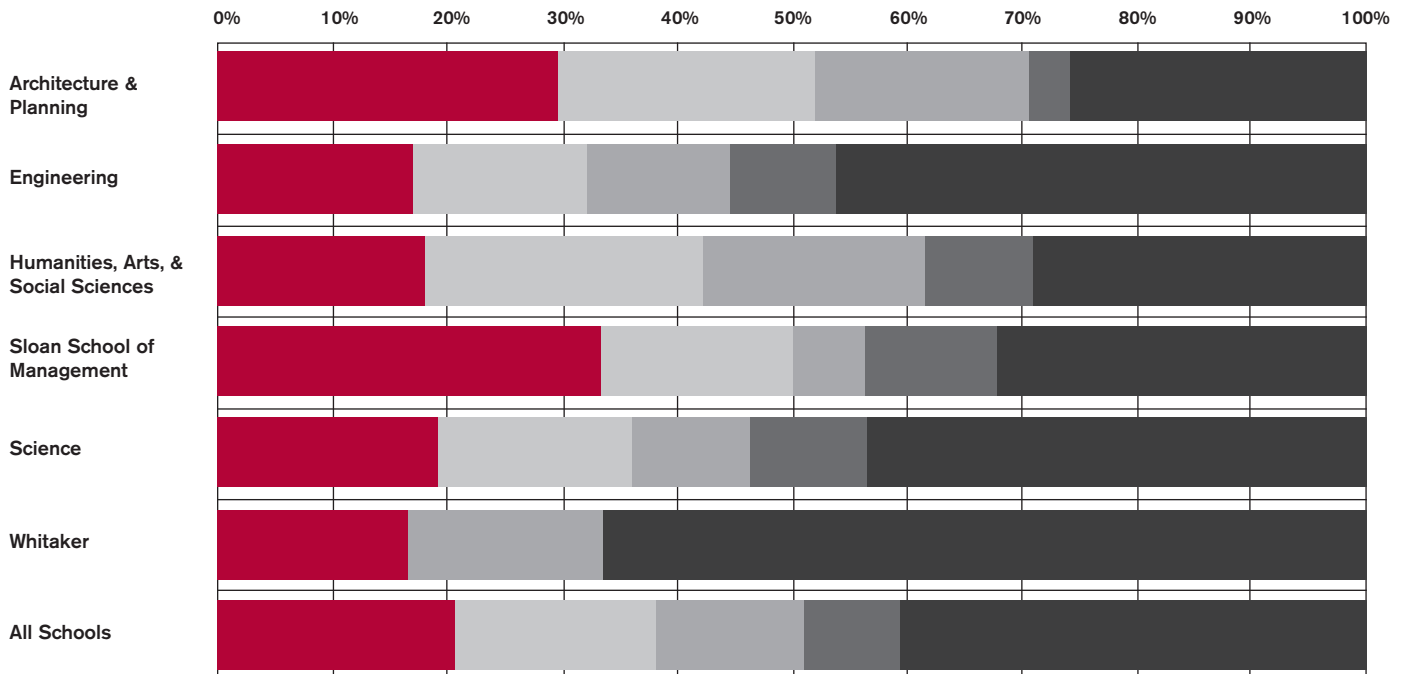
Reaching Us

Please address all submissions or comments to the *Faculty Newsletter* at fnl@mit.edu, or contact any Editorial Board member, listed on page 2. ■

M.I.T. Numbers
Individuals Appointed to the Faculty
(1985 – Present)

- July 1, 2000 and later
- July 1, 1995 – June 30, 2000
- July 1, 1990 – June 30, 1995
- July 1, 1985 – June 30, 1990
- Before June 30, 1985

Appointments By School



Source: Office of the Provost

From The Faculty Chair The Search for a New President

Rafael L. Bras

THE SEARCH FOR A NEW president of MIT is about to begin. It is easy to underestimate how important this choice is. Like all great institutions, MIT is always in search of new levels of excellence. If MIT is to continue setting the world standards of a university revolving around science and engineering, a good and effective leader will be essential.

MIT has had 15 extraordinary leaders, each exhibiting unique strengths and visions, each very much in tune with the times, and each able to recognize the major issues and opportunities of the day. These wise and fortunate selections were not the result of any well-oiled process, as we have had relatively little experience in presidential searches (a sign of past success). Rather, our successes have been due to the good sense of people, institutional knowledge, and commitment of members of this community, largely corporation members and faculty.

MIT is unique in its culture: in its science/engineering-centric education and in the individuals it attracts as students, staff, and faculty; in its research portfolio and in its role in the nation and the world as the harbinger of things to come in science and technology. Because of this uniqueness, leaders with MIT experience have most often been favored. But as Chuck Vest has demonstrated, it is possible for a leader to come from outside the Institute and not only quickly learn the culture, but indeed become more like MIT than its indigenous peoples. Quoting from Chuck, "The presidency of a university is not a job but a life." Our new leader must already have or be willing and able to embrace the MIT

ethos into his or her life – to become the personification of the Institute.

The last 14 years have been extraordinary for MIT. The Institute has evolved at a dramatic pace. This evolution has been the result of an alignment of external and internal challenges with leaders able to see and seize the opportunities lying fallow. During this period we have even lived through two serious financial crises – yet they have resulted in a healthier, better Institute. The success, I believe, resides in the optimism and confidence behind all decisions. Avoiding doom and gloom is the most efficient management strategy.

There is much to do to fulfill the agenda of the last few years, and even more to define the agenda of the future. The new president will face the challenge of increasing the number of women in the faculty and administration. He or she will also face the tougher charge of increasing the numbers of minorities in the faculty and the graduate student body. The new president will come in the midst of a major review of our undergraduate educational commons, which veritably defines the Institute.

The new leader must maintain and even enhance our role as the top research university in the world. Whoever takes this position will have to be innovative around increasing internationalization of MIT education and research. The new president must support the rapidly developing areas in biology, brain and cognitive sciences, information technology, and nanotechnologies, just to mention a few, while recognizing that other declared initiatives such as the environment, lag behind.

The new president must have a strong commitment to continue strengthening the social sciences, humanities, and arts programs. He or she will have to engage issues concerning the quality of life for students, staff, and faculty. The new president will need to continuously seek ways to increase the participation of faculty and the community in the decision-making process.

The fiduciary responsibility to select a president of MIT resides with the MIT Corporation. The recommendation for president is made by the Corporation Committee on the Presidency.

The members of that committee are:

- **Mr. James A. Champy**, Chairman of Consulting, Perot Systems Corporation, Chair
- **W. Gerald Austen**, M.D., Edward D. Churchill Professor of Surgery, Harvard Medical School
- **Mr. Gordon M. Binder**, Managing Director, Coastview Capital, LLC
- **Mr. Denis A. Bovin**, Vice Chairman, Investment Banking, Bear, Stearns & Co., Inc.
- **Mr. Dedric A. Carter**, Principal, American Management Systems
- **Dr. Arthur Gelb**, President, Four Sigma Corporation
- **Professor Edie N. Goldenberg**, Professor of Political Science and Public Policy, University of Michigan
- **Dr. Paul E. Gray**, Professor of Electrical Engineering and President Emeritus, Massachusetts Institute of Technology
- **Dr. Dana G. Mead** (*ex officio*), Chairman of the Corporation, Massachusetts Institute of Technology

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The Search for a New President

Bras, from page 5

- **Dr. Paula J. Olsiewski** (*ex officio*), President MIT Alumni Association, Alfred P. Sloan Foundation
- **Dr. Frank Press**, Principal, The Washington Advisory Group
- **Dr. Kenan E. Sahin**, President and Founder, TIAX LLC
- **Ms. Susan E. Whitehead**, Vice Chairman, Whitehead Institute for Biomedical Research
- **Mrs. Barrie R. Zesiger**, Managing Director, Zesiger Capital Group LLC

Consultants to the Committee:

- **Mr. Alexander V. d'Arbeloff**, Honorary Chairman and Professor of the Practice, Massachusetts Institute of Technology
- **Mr. Howard W. Johnson**, President Emeritus, Former Chairman of the Corporation, Massachusetts Institute of Technology
- **Dr. David S. Saxon**, President Emeritus, University of California, Former Chairman of the Corporation, Massachusetts Institute of Technology

In the past, the Corporation Committee has worked hand in hand with a Faculty Advisory Committee to the Corporation Committee on the Presidency. The Faculty Advisory Committee (FAC) for the current presidential search was selected by the officers of the faculty and the chair of the FAC, after considering input from the entire faculty (over 200 e-mails) and other forms of consultation with many individuals. In forming the committee we sought a representative group of respected faculty members whose knowledge and experience inside and outside of MIT are extensive. We looked for fair and open-minded colleagues who would be willing to spend the time the effort will demand.

The members of the Faculty Advisory Committee are:

- **Jerome I. Friedman**, Physics and Institute Professor, Chair

- **Rafael L. Bras** (*ex officio*), Civil and Environmental Engineering, Earth, Atmospheric and Planetary Sciences and Chair of the Faculty
- **Sylvia T. Ceyer**, Chemistry
- **Peter A. Diamond**, Economics, Institute Professor
- **Lorna J. Gibson**, Materials Science and Engineering
- **Stephen C. Graves**, Sloan School of Management
- **Paula T. Hammond**, Chemical Engineering
- **Kenneth R. Manning**, Rhetoric and History of Science, Secretary of the Faculty
- **Wanda J. Orlikowski**, Sloan School of Management
- **Rafael L. Reif**, Electrical Engineering and Computer Science

Go to <http://web.mit.edu/president/search> to learn more about the search process and to offer your suggestions.

- **Paola M. Rizzoli**, Earth, Atmospheric and Planetary Sciences and Associate Chair of the Faculty
- **Bishwapriya Sanyal**, Urban Studies and Planning
- **Isadore M. Singer**, Mathematics, Institute Professor
- **Marcus A. Thompson**, Music and Theater Arts
- **Bruce Tidor**, Electrical Engineering and Computer Science and Biological Engineering Division
- **Susumu Tonegawa**, Biology and Brain and Cognitive Sciences
- **Sheila E. Widnall**, Aeronautics and Astronautics and Institute Professor

The committees will be assisted by Dr. Kirk D. Kolenbrander, special assistant to the president and chancellor.

Many appropriate candidates were not selected, simply because of the limited number of slots, and I am sure that some constituency is not represented. This group has three more members than the last FAC. The reasonably large number of members on the corporation committee and the FAC also responds to the docu-

mented experience that size is an advantage, given the intensity of the effort and the unavoidable conflicts of time that people in both committees will have. We nonetheless are confident that the FAC as constituted will articulate and represent the Institute's broadest interests and goals for the future.

The Chairman of the Corporation Committee, Jim Champy, has expressed his intention of having the two committees work as one until the very end of the process. The two chairmen, Champy and Friedman, will set the working programs for the two committees. Equally important, they will define the processes necessary to secure the input of the broader MIT community, particularly staff and students. Students will have an independent advisory committee. The Corporation

has the goal of identifying the new president as soon as next June. While the schedule is ambitious, the chairmen of the committees have indicated that the process of consultation, investigation, and interview will be thorough and that a target date is useful but not imperative.

The committees will take whatever time is required to make the correct choice. Go to <http://web.mit.edu/president/search> to learn more about the search process and to offer your suggestions.

Since the faculty will be the main source of names of potential candidates, I urge all of you to actively participate in identifying viable candidates inside and outside of MIT. I suspect that the perfect candidate does not exist. I also believe that very good candidates are available and would be eager to be the leader of this great place. Please get involved and make sure that the faculty as a whole has a major input on the selection of our sixteenth president. ■

Rafael L. Bras is Professor, Civil and Environmental Engineering and Earth, Atmospheric and Planetary Sciences; Faculty Chair. He can be reached at rlbras@mit.edu.

Teach Talk

Assigning a Final Grade When Some of the Work Has Not Been Completed

James Kirtley
Jeff Meldman
Mary Callahan

THE GRADES OF I (Incomplete) and **O** (Absent) are sometimes used in a way that is inappropriate, which unduly and unnecessarily complicates the academic progression of a student and causes administrative difficulties. In many cases an ordinary letter grade is more appropriate. In this note we remind the faculty on use of the grades of I and O.

One of our most important functions is grading of student work. On occasion we find that, by the end of the academic term, we are not ready to issue a final grade. This may happen because a student has not managed to finish the work for the term. The faculty has established mechanisms for handling these circumstances. However, these mechanisms are often misunderstood and sometimes misused. In this memo, we seek to give guidance as to which mechanism to use and under what circumstances.

The Options

The instructor has three basic options when a portion of the assignments in a subject has not been completed:

1. Assigning the grade of I, which stands for “incomplete,”
2. Assigning the grade of O (the letter O), which stands for “absent,” or
3. Calculating a final grade using appropriately low scores for the missing work.

The Grade of I

The grade of I, or “incomplete,” should be used *only* when a student is missing a minor part of the work in the subject. *The Rules and Regulations of the Faculty* states this requirement as follows (sec. 2.62.3):

I Incomplete. This grade indicates that a minor part of the subject requirements has not been fulfilled and that a passing grade is to be expected when the work is completed.

To help the registrar, the Committee on Academic Performance (CAP), and the student’s home department to understand the circumstances of the I, the instructor is required to complete an “Instructor’s Report” to accompany every grade of I submitted. This report asks for four highly pertinent pieces of data:

1. Percent of work completed (minimum: about 80%),
2. Estimated grade in the completed part of the work,

In response to students’ letting incompletes “hang” for long periods of time and then eventually abandoning the subjects altogether, the faculty decided that no undergraduate can graduate with any unresolved incomplete on the record.

3. Default grade, assuming no more work is done, and
4. A due date for completion of the missing work.

These reports reveal problems in reporting of incomplete grades:

- In a bit more than half of the cases in which incompletes were assigned last year, less than 80% of the work was reported as complete.
- In about one quarter of cases in which an incomplete was reported, *no* explanatory form was submitted.
- In a smaller but still significant number of cases no due date had been arranged.

These reveal situations in which the grade of Incomplete is being used inappropriately.

Minor Part

The phrase “minor part” should be understood to mean *not more than about 20%*. An I might be appropriate, for example, in situations in which a student has missed a minor assignment or has misunderstood the assignment for a final paper and has not written that paper to the correct standard. In a lab subject, an I might be appropriate if the student has completed the final project but has not turned in the report. *Missing an exam is never the same as missing a minor part of the work.* If more than a minor part of the work is

missing, an appropriate letter grade (e.g., D or F), or perhaps the grade of O (see below), should be assigned and reported.

Default Grade

In response to students’ letting incompletes “hang” for long periods of time and then eventually abandoning the subjects altogether, the faculty decided that no undergraduate can graduate with any unresolved incomplete on the record. This has led to students petitioning the Committee on Academic Performance for very late drops of subjects that they do not need to graduate. A similar problem can arise when the student is willing to com-

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Assigning a Final Grade

Kirtley, et al., from preceding page

plete the missing work, but when the subject's former instructor and his or her records are no longer available. Since the CAP rarely grants petitions for late, retroactive drops, we sometimes see the spectacle of students begging departments to change their I grades, even to Fs if necessary, to enable them to graduate. To obviate this problem, instructors who use the grade of I are now being asked – in advance – for a default grade that represents the grade that the student would have earned using appropriately low scores for the missing work. The default grade should reflect only what the student has actually completed by the end of the original grading period and should not have any optimistic projections. *The default grade should always be lower than the “estimated grade in the completed part of the work” (item 2, above) because it is the grade to be used if the missing work is not completed.*

The Due Date for Completion of the Missing Work

The due date is important, too. The *Faculty Regulations* continue:

The work should normally be completed before Add Date of the succeeding fall or spring term; however, the faculty member in charge, in negotiation with the student, has the right to set an earlier or later date for pedagogical reasons or extenuating circumstances.

For example, if certain facilities, such as a lab or machine shop, are required and will not be available before the next Add Date, then a later date may be set. In such cases, it is important that this later date be set (and hopefully agreed to) before the incomplete grade is reported. The later date, and the reason for it, must be included on the “Instructor’s Report” that accompanies the report of the I grade.

Instructors and students should expect that, if the work for a subject in which an

incomplete was reported has not been completed by the due date, the default grade will be applied. If this happens and work is subsequently completed the instructor can change the grade in the established fashion (this requires approval of the department head).

The Grade of O

If a student does not complete work at the very end of the term, it may be appropriate to report a grade of O or “absent.” This is the right action to take if a student is absent at the final exam or does not turn in a paper due at the end of the term, but only if the student has been performing satisfactorily up to that point in the term. *The Rules and Regulations of the Faculty* define the grade as follows:

O Absent. *This grade indicates that the student was progressing satisfactorily during the term but was absent from the final or was absent from the last two weeks of the term, or both. An O grade carries no credit for the subject. Unsatisfactory performance because of absence throughout the term should be recorded as an F.*

This grade would be appropriate, for example, if a student has been receiving satisfactory grades in assignments, class participation, etc., during the term, but does not finish a term paper or a final project in a lab subject or misses the final exam. The grade of O is equivalent to the grade of F in its contribution to the grade point average. Unlike an F, however, an O can be converted into the grade of OX, and then possibly into a passing grade.

A student receiving an O can explain his or her late-term absence by visiting the Dean’s office (Counseling and Support Services). If the explanation is satisfactory, the counseling dean will convert the O to an OX, which stands for “absence excused.” This OX can then be completed by the student, for example, by taking a make-up exam during the next final examination period, or by turning in the missing term paper. The *Faculty Regulations* continue:

OX absence satisfactorily explained to and excused by the Dean for Undergraduate Education in the case of an undergraduate student or by the Dean for Graduate Students in the case of a graduate student. The Faculty member in charge of the subject will be notified when an O is changed to an OX. An OX carries no credit for the subject. However, the Faculty member in charge must provide the student the opportunity to receive a credit-carrying grade. This may be done with or without the instructor requiring a postponed final examination or other additional evaluation procedure.

There are good reasons for using an O rather than an I in some circumstances. If there are external problems that have contributed to the student not finishing the work for the term, the process of getting the absence excused (conversion of the O to an OX) gets the student into the Dean’s office where the counseling staff can do some good. If the student chooses to not complete the work the O or OX can remain on the record. Unlike the grade of I, an OX will not prevent the student from graduating (unless the subject is a curriculum requirement), but it will serve as an unmistakable marker of the student’s progress.

Otherwise

If neither the grade of I nor the grade of O is appropriate, it is important to report a grade calculated by using appropriately low scores for the missing work, even if the final grade is a D or an F. Instructors sometimes do not realize that turning in a Grade Report Sheet with a missing grade – or holding back a grade sheet because of a missing grade – can cause serious problems for the registrar, for the CAP, and for students’ home departments. ■

James Kirtley is Professor, Electrical Engineering and Computer Science. He can be reached at kirtley@mit.edu. **Jeff Meldman** is Associate Dean for Undergraduate Education. He can be reached at jmeldman@mit.edu. **Mary Callahan** is Registrar. She can be reached at callahan@mit.edu.

MIT Finances

Brown, from page 1

the world with emphasis on science, engineering, and management. Our faculty and students are second to none; our programs are ranked among the very best in the world and we are both sustaining our excellence in core programs and embarking in new, exciting directions. In the last economic cycle, we used new resources to strengthen the core of MIT. In the last two years, we have made the difficult budgetary decisions necessary to find the “bottom” created by this economic downturn and we are positioned for growth in the years ahead.

Background

In the second half of the twentieth century, MIT was shaped by the emergence of federal support for academic research and the development of the research university in the United States. As the system for support of private universities evolved in the last decades of the century, MIT had to face the challenge of moving a substantial portion of the support for our programs and infrastructure in science and engineering from external research support to private support. Substantial portions of the academic year salaries, funding for infrastructure, such as our library, and the cost of graduate students supported by research contracts and grants had to be supported by the Institute, and not directly from contracts and grants. This shift from sponsored research to internal support was made possible by aggressive and successful fundraising for our endowment and by a successful long-term investment strategy. The MIT endowment has increased substantially since the early 1990s, with a large portion of this increase coming from the high rates of investment returns in the second half of that decade. With this increase came the opportunity to use the increased income from the endowment to benefit the most important initiatives in the Institute. After much discussion, the core needs of the Institute

were distilled in President Vest’s fall 1998 report, entitled *The Path to the Future*. The major issues and our strategies for addressing them are summarized below:

1. Controlling the Cost of Graduate Research Students to Sponsored Research.

One of the most important core values of MIT is the integration of graduate education into research and scholarship. By 1995, changes in funding forced on MIT by external regulations left the Institute in danger of having the cost of graduate research assistants to contracts and grants becoming so high as to seriously affect our competitive position. We put in place the Research Assistant (RA) tuition subsidy program to address this challenge by formally subsidizing 65% of the nine-month tuition and eliminating the tuition on RAs during the summer for students doing research only.

2. Attracting the Best Graduate Students to MIT.

More frequently we are recognizing the intense competition for attracting the very best graduate students to our programs. Graduate fellowship support is becoming an important resource for funding incoming doctoral students. The Presidential Fellowship Program was begun using discretionary funds, with the goal of raising endowment support during the capital campaign.

3. Giving Competitive Undergraduate Financial Aid.

MIT must remain accessible and attractive to the best undergraduate students, irrespective of the financial background of the student. Keeping this commitment required MIT to aggressively commit additional resources to financial aid in order to keep the self-help level (the amount of funding that a needy student must supply through work-study and loans) in line with our peer institutions.

4. Improving Student Life.

The Task Force on Student Life and Learning

calls for MIT to increase the integration of student life with education at both undergraduate and graduate levels. We have invested in both new programs and spaces to move toward these goals.

5. Renewing the Physical Infrastructure.

MIT entered this century with significant deferred maintenance and with a large demand for new types of spaces for research, education, and community. We have invested in our physical infrastructure by increasing the Institute budget for renovation and by investing in capital projects to create new space. In many cases, the investments in renovation and renewal have been blended with needs in student life (e.g., new dormitories for undergraduate and graduate students, the Zesiger Sports and Fitness Center, the TEAL classroom and other classroom renovations) and with important initiatives in our schools (e.g., renovation of buildings 37 and 18, the Stata Center, the Brain and Cognitive Sciences Project, and specific renovations for new faculty hiring and research initiatives).

It is easy to see that the majority of our investments have been used to fund core issues within MIT. We have not increased departmental budgets greatly, except for the increase in funds available to the academic units through increased income from their restricted endowments. We also have made \$5M/yr. available each year between FY98 and FY03 for increasing general institute budgets in support of proposed initiatives. The competition for these new funds has been keen.

These investments in the core missions of the Institute seem to be reaping the benefits we had hoped for. Education and research is as vibrant as any time I have seen. Our undergraduate student body is as excellent as any time in MIT’s history. Over one-third of the faculty has joined us since 1996, bringing innovation to research and education. This faculty hiring has been made possible with tremendous investments by the

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MIT Finances

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departments, schools, and the Institute. Our graduate programs are thriving and research on campus has grown at the highest annualized rate we have seen in decades. The Presidential Graduate Fellowship Program and increased fellowship support within departments and schools has kept our graduate recruiting competitive.

The investments also have had significant impact on MIT's annual operating budget. We have represented the expenditures associated with several of these initiatives pictorially on the plot below. Here the total on-campus operating budget for research and education (excluding Lincoln Laboratory) is displayed as a function of the fiscal year, along with the incremental portion of this budget that is associated with four parts of the core expenses described above; the Presidential Fellowship

Program, the graduate tuition subsidy for RAs, the renovation budget, and the cost of new construction.

For reference, the total on-campus operating budget for FY04 is approximately \$1,370M, of which approximately \$347M is supported by the direct cost of research. The remaining \$1,025M of the budget is supported by tuition, gifts, income from the endowment, and the indirect cost of research (Facilities and Administration [F&A] costs). Approximately half of the budget is the cost of compensation and employee benefits, and there will be about \$50M in interest and \$50M in principle payments associated with capital construction.

As you can see, the largest commitment of additional budget and thus income from the endowment, has been associated with the graduate research tuition subsidy, followed by the renovation budget. The cost of new construction to the operating budget is shown in this display as net of revenues generated by

each project. These revenues include rents generated by the dormitories, fees for membership in the Zesiger Center, and F&A recovery on the depreciation of research space.

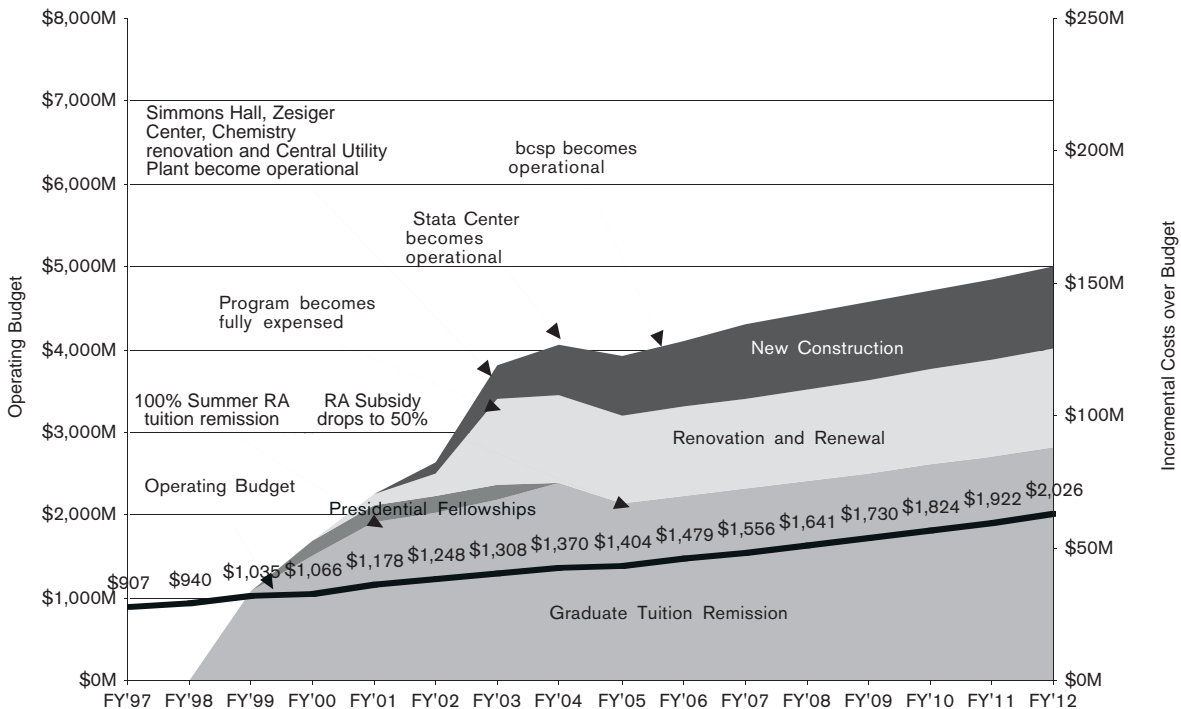
The increased commitment to undergraduate financial aid is not shown in this display. The budgetary commitment is most clearly seen by examining the undergraduate self-help level. MIT has gone from a self-help level of \$8600/yr. in FY97 to \$5500/yr. in FY04. As a result of this policy and increases in tuition, room and board, our average scholarship level has increased by \$6,000/yr. for the over 2000 needy students in our undergraduate student body.

The MIT Endowment

The investments described above have been made possible by the increase in value and, hence, in income from our endowment. Unitized in 1969, the increase in the endowment can be separated into the effect of increasing the

Projected Campus Spending Detail (excluding Lincoln Lab)

New Construction is Net of Revenues and Cost Recovery



endowment through new gifts, which is represented by the growth in the number of units of the endowment, and history of the value of an average unit, net of the distribution of funds from the endowment for operation of MIT, which represents the impact of investment growth. The

by the Investment Committee of the Corporation and voted by the Executive Committee. The distribution has increased from approximately \$12/unit in FY91 to a high of \$42 unit in FY03.

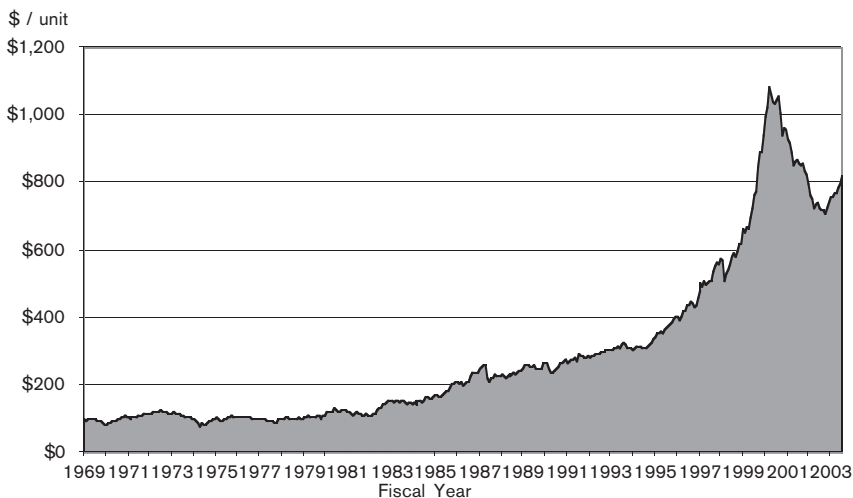
Even with this increase in the distribution from the endowment, we would not

cost is presently set at 25% of the annual distribution from appropriate accounts.

The value of a unit of the endowment has decreased for each of the last three years and our financial planning for the performance of the endowment this fiscal year (FY04) assumes conservative returns this year. The decline in the unit value has necessitated a drop in the distribution from the endowment. The distribution in FY05 is expected to decrease from \$41/unit in FY04 to \$36/unit in FY05. These decreases should be put in context of the robust increases of the last few years; for example, the distribution rate in FY98 was \$18/unit.

Endowment Unit Market Value

FY1970 to FY 2004 (1st half)



History of unit value of MIT endowment from 1969 to 2003

history over the last 35 years of the value of an endowment unit is shown in the plot above. There are currently about 7 million units of the endowment with a unit value as of October 2003 of \$788/unit.

The control of the 7 million units of the endowment is distributed across MIT approximately as follows: 2.8 million units are controlled by departments, schools, and the provost; 0.8 million units are restricted to undergraduate financial aid; and 3.4 million units are unrestricted with the income being used for the general institute budget.

The annualized appreciation of the value of a unit of the endowment is over 6% per year over the 35-year period. When distributions are included, the annualized rate of return is over 10%. The distribution from the endowment to the operating budget tracks the unit value according to a distribution rule proposed

have been able to accomplish the agenda described above without two important developments in the financing of MIT. In a plan crafted between 1998 and 2000, the Executive Committee agreed that it would be appropriate to spend an additional increment of endowment over the decade, FY01-FY10, for the core needs of the Institute. This additional allocation amounts to a de-capitalization of unrestricted endowment outside the funds distributed through the distribution rule. By agreement this amount has been set at \$500M with increments of the expenditure budgeted on an annual basis.

Second, after extensive discussions with the academic units, the deans, and the Executive Committee, MIT instituted an annual service cost on specific endowment accounts to fund core needs that can be directly associated with the accounts; e.g., association of the RA tuition subsidy with faculty professorships. This service

Basics of MIT Operating Budget

The annual MIT operating budget relies on revenues from tuition, research (through F&A), gifts, and income from the endowment to pay for the \$1,025M of expenses. Several of these revenues are highly constrained. MIT's undergraduate tuition is among the highest in the United States and revenues from tuition, net of the financial aid demands, are not expected to increase at more than a nominal rate. Because the indirect costs of research are a set of expenses agreed upon with our federal auditors, increased research volume does not give MIT greater financial leverage. If the costs of research (for space and administration) stay the same, increasing the research volume decreases the F&A rate. We have seen this dynamic over the last several years as the F&A rate has decreased from 63.5% in FY98 to 60% in FY04.

Simply stated, growth in the operating budgets at rates greater than the nominal inflation rate has to be supported by increases in gifts and income from the endowment. The stress on the operating budget in FY04 and FY05 is caused by a combination of the downturn in investment income and by increased expenses. There are several categories of expense increase that go beyond those described above. Most notable is the cost of our employee benefits, which has seen substantial increases because of a combina-

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tion of health care costs and the investment returns on our defined benefit pension fund. As a result, the employee benefit rate charged to all compensation, both internally and direct charged to sponsored research, has risen from 18% in FY97 to a projected 25% in FY05. The cost to the MIT operating budget of this increase is projected at \$25M/yr next year.

Adjustments in Operating Budget for FY05

Developing budgets for FY04 and FY05 has been challenging, because of the need to compensate for the continued decline in endowment income without compromising the core values and excellence of MIT and the momentum that has been established in the last decade. The FY04 budget that we have in place for this year included almost \$39M/yr. reallocations of revenues and budget reductions.

Those changes that were most felt by the academic and administrative units

faculty meeting and worked together throughout the summer and fall to come to where we are today. Instead of discussing the changes in sequence, I think it will be more valuable to talk about the impact on specific programmatic areas in the context of these changes.

These changes can be categorized in terms of:

- Undergraduate financial aid
- Cost of graduate research and reduction of graduate fellowship support
- Reduction in endowment income and general institute budgets of academic and administrative units
- Salary Freeze

Undergraduate Financial Aid. One decision seemed very straightforward. The Institute's commitment to undergraduate financial aid is unchanged. Although lowering the self-help level further does not seem possible in FY05, we are committed to maintaining the current level of undergraduate financial aid. The decrease in endowment income will force a larger portion of this aid to come from the

tuition subsidy on graduate research assistants will decrease from 65% to 50%, resulting in an increase of the cost of a graduate student to a contract or grant by over \$4000/yr. This increase puts pressure on the cost of graduate students on contracts and grants at a time when the rising cost of health insurance and the cost of living is making it increasingly difficult for graduate students to live on their stipends. This issue needs to be resolved. Hopefully, by the time this article is printed, we will have a plan that helps graduate students to cope with the increasing cost of health care, and faculty to deal with the pressure on the cost to contracts and grants.

Also, as planned, the support from the general institute budget for the Presidential Fellowship Program concluded in FY03, and the Program continued this year with funding from endowment raised for this purpose and with discretionary allocations from the provost. The number of Presidential Fellows decreased from a high of 171 in FY03 to 72 in FY04. Because of increased gifts, we have allocated a total of 112 Presidential Fellows for FY05. Although the total number of presidential fellowships is ridiculously small relative to the size of the incoming graduate student class for the Institute, the program has demonstrated that the need for graduate fellowship support is becoming more pronounced across much of MIT. Many departments rely on these fellowships for recruiting the very best graduate students and for sustaining the funding system for doctoral education. The message here is clear: MIT must continue the campaign for graduate fellowship support in the years ahead.

Academic and Administrative Budgets. Academic units were given planning information in May 2003 to begin planning for the decreased endowment distribution in FY05. The impact is substantial, translating into \$10.5M/yr. in decreased revenues to the academic units. Although painful, we believe this decrease can be accommodated, because of the substantial increases over the last five years. The plan-

One of the major points of concern is the impact of the current financial situation on our graduate programs and on graduate student-based research. Several changes have impacted the cost of graduate student-based research. . . . Hopefully, by the time this article is printed, we will have a plan that helps graduate students to cope with the increasing cost of health care, and faculty to deal with the pressure on the cost to contracts and grants.

were a \$1/unit reduction in distributed income (a loss of \$2.8M/yr. in revenue to units), \$4M/yr. reduction in funds available for the academic budgets, and \$13.3 M/yr. reductions in administrative budgets. Many academic units also were hit hard by changes in interest income rules on unspent fund balances.

Developing the FY05 budget has been much more difficult, because the magnitude of the adjustment needed between revenues and expenses is about \$70M/yr. We began this process in the spring of 2003 with a presentation at the April

general institute budget instead of endowment income that is restricted to undergraduate scholarships. We estimate that the additional funding needed in FY05 will be approximately \$20M.

Support for Graduate Students and Graduate Research. One of the major points of concern is the impact of the current financial situation on our graduate programs and on graduate student-based research. Several changes have impacted the cost of graduate student-based research. First, starting in FY05, the

ning for these decreases and their impact falls totally on academic units that have endowment income.

Decreases to academic and administrative unit budgets are needed to compensate for the loss of income from unrestricted endowment, from the decreased income from the service costs, and by the cost increases to the Institute. The aggregate decrease in the budgets for academic units is \$11M/yr. These are distributed as follows:

- \$2M/yr. decrease in discretionary funding for the provost's office. This amounts to a 20% decrease in the funding available for faculty start-up, cost-sharing, and new initiatives.
- \$3M/yr. decrease in academic unit budget. Portions of this reduction have been distributed to units after considerable analysis and discussions with the deans. Making budget decisions at MIT is very difficult. The quality of the students and faculty is uniformly excellent and we invest very little in programs at the margins of our core activities. This is essentially the same level of budget decrease experienced in FY04. Although there is no doubt that the funding will be missed, it does not appear that the quality of our programs will be in jeopardy.
- \$5M/yr. decrease in renovation budget. This amounts to an approximately 20% decrease in the budget available to CRSP (Committee on the Review of Space Planning) for renovation of facilities.
- \$1M/yr. decrease of faculty budget. Holding the resources for faculty hiring constant does not seem appropriate when academic and administrative budgets are seeing substantial decreases and the Institute is freezing salaries. We have proposed to decrease the number of funded and open faculty positions by 11 in FY05 (there are currently approximately 60 such positions within the Institute). The plan is to allow schools to propose to replace these positions starting in FY06 with these requests prioritized with their other priorities for the new budget.

The budget reductions in the administrative units (e.g., Information Systems,

Human Resources, Facilities, etc.) are much more severe and amount to over a \$25M/yr. decrease in expenses, including contributions from student dining and housing. These changes will lead to a substantial number of layoffs and some realignment of services. Much of the month of January will be spent finalizing these changes and communicating to the community potential impacts. We are

The financial planning and the budgeting for FY05 have been put in place to bring expenditures in line with our expected revenues. With these changes and with reasonable economic conditions and investment returns, the MIT budget should be able to grow at a steady rate in the years ahead. Our continued excellence and competitive position are not in question.

very sensitive to the potential for adverse consequences in one unit caused by a budget reduction in another, and we are analyzing the impacts of all the proposed reductions to minimize these impacts.

Salary Freeze. After the changes in costs and reductions in revenues and expenses described above, the approximately \$70M gap was reduced to approximately \$10M. Two choices remained; either reducing the academic budgets an additional \$10M/yr. or freezing salaries for all except those with the lowest compensation levels. We presented these alternatives at the September faculty meeting and discussed the consequences throughout October. Although the decision to freeze salaries was difficult, it seems the right one compared to the severe consequences of an additional budget reduction of this magnitude, which would negatively impact our programs and lead to substantial staff reductions. The trade-off against these reductions was to forego a small (2-3%) salary increase for all employees making over \$55,000 per year.

Looking Ahead

I hope that with this article all understand the FY05 budget, and let us begin to turn

our attention to the future of MIT. Each time I talk with colleagues about MIT's financial planning I worry that I am unsuccessful in making clear the underlying principles, at laying out the options and trade-offs, and at engaging others in the discussion. The important strategic issues are critical; however, in each discussion there are questions asking for more detail. MIT is a data driven environment.

The important messages are simple. The financial planning and the budgeting for FY05 have been put in place to bring expenditures in line with our expected revenues. With these changes and with reasonable economic conditions and investment returns, the MIT budget should be able to grow at a steady rate in the years ahead. Our continued excellence and competitive position are not in question.

Will there be enough growth to satisfy all demands? This is obviously not feasible. The finiteness of our resources will continually constrain our seemingly unlimited ambitions. This constraint, more than any other, forces us to continuously rethink the core values of MIT, to define the institution we must be and what we should not attempt to do. We must continue to do this self-evaluation, to find more ways to engage as many of our faculty who are willing in this discussion, and to continue to redefine this unique Institute into the twenty-first century. If we do this, MIT will continue to be the very best university of its type in the world. ■

Robert A. Brown is Provost. He can be reached at rab@mit.edu.

Vest to the Faculty

Vest, from page 1

president to office. That is the answer to the question “Why now?”

What about the “What next?” I don’t know exactly what I intend to do next; I haven’t really had time to think about it. The Executive Committee has been kind enough to assure me that I will have the option of having a sabbatical year, and right now, I intend to do that. It will be the first sabbatical I’ve had since 1974. It’s time to sit back and think a little bit about what I’ve observed and have been privileged to do. I have some writing I want to do, and I want to think about what things I might do next. Those of you who know me well know that the Academy is in my genes. It’s in my blood. I can’t imagine being anywhere than in a university. And after having given heart and soul to this great university for so long, I don’t intend in any way, shape or form to move to another institution. I hope to find a way to carve out a role here at MIT while also devoting perhaps even more time to various forms of national service and doing some work with non-profit institutions as well.

But first, we have a lot of work to do. Together we have a campaign to finish. We have to do the hard work of getting through this next couple of years of difficult financial times. And we have to continue to sustain the excellence of this institution and all of the things that have come about over this last 13½ years.

But the reason I wanted to spend a few minutes with you today is to make some very personal observations about the presidency of this university as I have experienced it, or more to the point, as Becky and I and our family have experienced it. I want to share some aspects of a university presidency for you to think about as you consider the matter of my successor.

At my inauguration in Killian Court, I began my remarks by saying that my path through life and the path of this institution had converged. I cannot tell you how deeply that convergence actually occurs.

The presidency of a university, unlike virtually any other occupation I can think about, is not a job – it is a life. Unlike some university presidents who refer to themselves as CEOs, I have always believed that the presidency is about being among, living with, and serving this extraordinary community. It truly is a life. It is not a job.

When I had the opportunity to come here, I felt it was a call to national service. And today, I feel even more strongly that being asked to serve in this position is a call not only to national service but, indeed, to world service, because we are one of the great and important institutions in this nation and in our world.

Now what Becky and I have experienced is very difficult to summarize in a few minutes. The merging of our private and public and professional lives into one thing is quite hard to describe. During the period that we have lived here, we have lost three parents, two dogs and a cat. As you know, we have been through the direst of medical emergencies, and Becky is alive today only because of the extraordinarily expedient and highly professional work of our Campus Police force.

But good things have happened in our personal life as well. When our family gathers here for what we expect to be our last Christmas in Gray House, we will be joined by two wonderful children who, since we came to MIT, have graduated from college and received graduate degrees (one in medicine, one in political science). We will have with us a wonderful son-in-law, a wonderful new daughter-in-law, and two extraordinary grandchildren – none of whom were in our lives before we came here.

The time that we have shared with you has been quite remarkable. In the conduct of our duties, we have met kings and queens and princes and princesses and presidents and heads of state all over the world. Becky and I have had experiences that, as young children growing up in West Virginia, we could never have imagined. But I have to tell you that the real honor in this time has not been those parts of the experience. It has been

working with and knowing and supporting the faculty, students, staff and alumni of this extraordinary institution.

What have I learned in all this time? I thought about that last week as I was preparing to announce my decision to our Corporation. What I’ve learned above all else is the real meaning of the word excellence. One of the problems when you live and work day-in and day-out in a place like MIT is that you see all the warts, and you know all the stresses and strains. Every now and then, it is easy to forget what an extraordinary group of people are gathered here. But the level of excellence with which they perform their work in research and teaching, and in supporting those functions, is truly remarkable.

We have accomplished a lot together during this time – we in the faculty and the staff and the administration. Despite the immediate problems that we have to grapple with over this couple of years, the finances of the Institute are strong. Our endowment has grown from \$1.5 billion to over \$5 billion. We have brought in 18 of the 25 largest gifts in the history of MIT. And we are coming very, very close to a successful completion of a \$2 billion capital campaign – a number that we probably couldn’t have envisioned back in 1990.

We have a lot to be proud of in our diversity agenda, and in our agenda for gender equity in our professions. But the one place that I feel that I have really failed you is that we have not accelerated the racial diversity of our faculty or, for that matter, of our graduate students and staff. We have much more to do in that domain. I urge you to consider that as an important factor as you seek your new president, and as we work together to continue that quest in the coming months.

Amazingly, when the new Brain and Cognitive Sciences project is completed, we will have constructed 25 percent of the MIT campus since 1990. And also during this time – with the leadership of our provost, Bob Brown, his predecessor provosts, Joel Moses and Mark Wrighton, our deans and department heads and the

faculty – we have hired 50 percent of the current MIT faculty.

And, as you know, I've placed a lot of personal emphasis on MIT's characteristic engagement with the larger world – not only through our traditional means of first-rate teaching and research but through initiatives such as OpenCourseWare, the Cambridge-MIT Institute, the Singapore-MIT Alliance, and the Alliance for Global Sustainability. In these and so many other ways, we have tried to reach out and work with others in industry and government world-wide to attack some of the really daunting problems that face humankind.

We have worked to try to influence national policy in productive ways. For my own part, I go with some frequency to Washington, simply to try to maintain a steady drumbeat for the importance of Federal funding of higher education and research in science, engineering and mathematics. We've done the tallies. In the pursuit of that quest, I have made 109 trips to Washington for 450 different individual appointments with over 250 different people. In addition, there were another 80 trips associated with service on the President's Council of Advisors on Science and Technology and other committees and councils having to do with national policy in higher education, competitiveness and research.

But, perhaps more than anything else, we have worked together to bring about a real recommitment to the quality of student life and learning on our campus. This has been a rocky path, and one that is not yet complete. But I think we have come a long way toward making this an even better institution for our future students than it has been for us, and for those who preceded us.

Much more is to be done, and I don't intend to slow down my efforts over the next nine or ten months or whatever it takes to find my successor. And I look forward to continuing to do these things together with you. But, as you seek a new president, I want to state the obvious: never underestimate the importance of this institution. What MIT means to our



The Dalai Lama, President Vest, and Professor Phil Sharp

nation and our world is not approached by any other university or college on the face of the planet. I hope that this is foremost in your mind as you undertake this new search.

I have often been asked by friends outside the university, "What's it like getting to know all these big CEOs and government leaders and so forth? Isn't that a daunting thing?" The fact is, it isn't. For me, the most remarkable opportunity has been getting to know members of this faculty – to look in the mirror when I'm shaving in the morning and say, "You know, Mario Molina's a good friend of mine. Phil Sharp's a good friend of mine." These are things that cannot be duplicated in any other sector or, literally, in any other institution.

I also hope that, as you seek a new president, you think about our students first and foremost. The students – the young men and women who come here to study as undergraduates or graduate students or post-docs – are among the most incredibly talented, brilliant people on the face of the earth. These are the real jewels of MIT. They are the reason we are here. And we have a very, very deep responsibility to help them to learn and to grow and to give their talent to the world in the same way

that you, the members of our faculty, and our staff, already do.

As I said in my letter to you, one of the most beautiful things about a university is that it is never finished. As our illustrious Vannevar Bush famously said, we're about an "endless frontier." We're about seeking something that we never, ever reach. It's a great ongoing adventure, and a very important one.

Now I'll close with the same thought with which I ended my announcement to our Corporation. Most of you know Glenn Strehle, who was our vice president for Resource Development and, for many years, the treasurer of MIT. Glenn spent a little time with our family last summer. When I saw him in early September, he said, "Chuck, I want to say something to you. I used to carry around a little list of things that I thought were wrong with MIT." Then he said, "You know what? You've fixed every one of them. But I know how you're going to be remembered. You're going to be remembered as Mary Gay's grandfather."

And that's just fine with me. ■

Charles M. Vest is President. He can be reached at cmvest@mit.edu.

MIT Poetry

IDENTIFYING MY FATHER

I'd hoped cremation would avoid this.
"But we wouldn't want a mixup
with the ashes," he said. At least no Muzak,
and he wasn't an unctuous hand-rubber
in a too-black suit. The chairs were
just shy of comfortable, magazines (all
about travel) were strewn on low tables:
the look of a Holiday Inn lobby.

A hallway. A room with three caskets. The guy
was polite, serious: "The one on the right."
We walked over, my mother and I, anything
but at ease. The head slowly came into view
over the wooden edge: a head full of white hair,
a narrow, bony face, and . . . a beard?
I'd expected a vast, sad change, but could this
be my brown-haired, portly, smooth-cheeked father?

The guy saw puzzlement in our eyes, looked down
at the false-leather folder he carried. "Oh,
Lord," he said — not loud, but you could hear
the shame in his voice. "It's next door."
Even more hesitant now, we followed, looked,
stood, signed papers, while the boss babbled apologies.

Nearly the last thing Dad said to me was,
"That's another story." Tale-lover, always working
the crowd, he'd have dined out on this one for months,
What I miss most about him, almost,
is his deft way with a punchline.

— John Hildebidle

A CHILD'S CHORE

*William Barton Rogers, the first president of MIT,
died while delivering the President's Address in 1881.
His last words as he lay on the commencement
platform were "bituminous coal."*

Each winter month the coal truck
dumped behind our house
like some rough beast
its burden on the ground.

Coal-scuttle and lamp in hand,
I followed snowy prints I'd made the night before
to where the coal man binned the coal.
It was a witch's den.

My eyes made rats of shadow shapes,
my ears, snakes of the wind.
Cursing aloud, I wielded the shovel,
filled the scuttle to its fat, protruding lip

and dragged it to the kitchen.
I crammed the maw of the Arcola stove,
watching as it gobbled coals
like Dante's Satan gobbled souls.

I banked the fire and went to bed.
In the morning I turned a crank dislodging
last night's ashes and lugged the grimy ash box
back along the trampled path for burial.

The bottomless Arcola is long since gone,
melted in an ironmonger's
bigger stove, turned to nails,
or someone's gate.

Its memory has grown cold as well.
Yet when I die, "anthracite"
will be on my lips,
hard, clean, dustless.

— Samuel Jay Keyser

Research at MIT The Laboratory for Nuclear Science

June L. Matthews

What is LNS?

THE MIT LABORATORY FOR Nuclear Science (LNS) was established in 1946, and now, nearly 60 years later, it is still thriving, although its name has become somewhat anachronistic. The word “Laboratory” is in fact too narrow, as LNS includes the Center for Theoretical Physics. The word “Science” is in fact too broad; whereas originally LNS included researchers in Nuclear Chemistry, at present we are all members of the Physics Department. As for the word “Nuclear,” back in 1946 the field of Elementary Particle Physics did not exist as a separate discipline, but was just called “High Energy Nuclear Physics.”

Although the history and evolution of LNS would be an interesting tale to tell, that is not the purpose of this article. I will attempt to summarize the current research activities of what could be more properly termed the “Laboratory for Nuclear and Particle Physics.” My theorist colleagues, by the way, have assured me that they have no objection to working in a “Laboratory,” as long as they’re not expected to manipulate any equipment, or take night shifts on experiments!

Where is LNS?

Some readers might be wondering which of MIT’s numbered buildings houses the 40 faculty, 35 research staff, and over 70 graduate students associated with LNS. Well, the administrative headquarters of LNS are located in the Karl Taylor Compton Laboratories (a.k.a. Building 26); several of the research groups and their students also reside there. Other

groups can be found in Building 6 (the Center for Theoretical Physics), Building 24, and Building 44. LNS also includes the Bates Linear Accelerator Center, about which there was an article in a previous *Faculty Newsletter* [April/May 2003], located in Middleton, MA, 20 miles from campus. Moreover, many of the experimental researchers spend considerable time at off-campus accelerator facilities, as I will describe later. So, in a sense, LNS might be thought of as a “virtual laboratory,” with much of the “real work” being done away from its actual premises.

The mission of LNS remains unchanged since its inception: to investigate the properties and interactions of the fundamental constituents of matter. Many of you may now ask “What are the fundamental constituents of matter?” and I will try to answer this question.

Physics in LNS

The mission of LNS remains unchanged since its inception: to investigate the properties and interactions of the fundamental constituents of matter. Many of you may now ask “What are the fundamental constituents of matter?” and I will try to answer this question. We believe that all ordinary matter is composed of two types of fundamental particles: leptons and quarks. These are fundamental in that they are presumed to have no internal substructure. We have peeled away all the layers of the onion, from visible objects to molecules to atoms to nuclei to nucleons (the protons and neutrons that make up the nuclei) to quarks, and we have reached the end of the line.

The most familiar lepton is the electron. In numbers between one and about 100, electrons form the outer shell of atoms, and carry the current in all the electrical devices we use every day. Although single electrons can flow freely through wires and through space and can readily be observed in experiments, quarks cannot be observed singly but only in pairs or triplets. The proton, which is the nucleus of the Hydrogen atom, consists of three quarks, as does its uncharged partner, the neutron, which is needed to make up all of the other atoms. For each

quark and lepton there is a corresponding anti-quark and anti-lepton, with opposite electric charge. There is an additional set of particles that transmit the forces (electromagnetic, and so-called “weak” and “strong”) among the quarks and leptons. This picture is so successful in explaining the sub-atomic world that it has come to be known as the “Standard Model.”

It is the task of Elementary Particle Physics to study the properties and interactions of the quarks and leptons. Quarks are bound into hadrons (a word of Greek origin signifying “strongly interacting particle”) of which there are two types: baryons – heavy particles which include the proton and the neutron, and mesons – intermediate mass particles which are

continued on next page

The Laboratory for Nuclear Science
Matthews, from preceding page

composed of quark-anti-quark pairs. Nuclear Physics deals with the interactions of protons, neutrons, and mesons to form the nucleus of the atom. (Atomic Physics takes over “after” the electrons are attached to the nucleus.)

The field of Elementary Particle Physics is often called High Energy Physics, because one needs to accelerate probing particle beams to very high energies in order to “see inside” the hadrons. As an everyday analogy, although most matter is opaque to visible light, it becomes transparent to x-rays, which are simply a higher energy (shorter wavelength) type of light.

The boundary between Particle and Nuclear Physics has become blurred during the past several decades: a new field called, not surprisingly, Intermediate Energy Physics has emerged, in which one works at the interface between High (i.e., particle) and Low (i.e., nuclear) energies. One studies the interplay between the quark structure of the hadrons and the interactions of these hadrons to form the simplest nuclei: Hydrogen (one proton), Deuterium (one proton and one neutron), Tritium (one proton and two neutrons), Helium-3 (two protons and one neutron), Helium-4 (two protons and two neutrons).

Experimental Research in LNS

LNS researchers are active in various facets of the physics described broadly above. I will first discuss Intermediate Energy Physics. The Bates electron accelerator laboratory was built in the early 1970s to pioneer this then new field, and continues to perform research at its forefront. The detector known as BLAST (Bates Large Acceptance Spectrometer Toroid) that was described in the earlier *Newsletter* article, has begun taking data of unprecedented precision and will provide PhD thesis material for at least a dozen graduate students. One of the most challenging measurements will be of the

internal structure of the neutron: although electrically neutral overall, its charged-quark composition implies regions of positive and negative charge inside the neutron.

Although Bates has had many successes (including the education of over 100 graduate students, many of whom are now leaders in the field), its “reach” is limited by the maximum energy of the accelerator. There are some experiments that require higher energy electron beams in order to probe more deeply into the substructure of nucleons and nuclei, and such beams exist at the Thomas Jefferson National Accelerator Facility in Newport News, Virginia. Several LNS researchers have made major contributions to the construction of the experimental apparatus at this laboratory and maintain extensive research programs there.

High Energy Physics requires particle accelerators that are generally of such large scale that they are situated at National Laboratories rather than on university campuses. The Fermi National Accelerator Laboratory, located near Chicago, is one of these. The very highest energies can be achieved by using the same machine to accelerate two separate particle beams and allowing the beams to collide head-on. Fermilab currently has the highest energy colliding (proton-anti-proton) beams in the world, but in a few years the “energy frontier” will be ceded to the European laboratory CERN in Geneva, Switzerland, at which the Large Hadron Collider is under construction. The primary motivation for performing experiments at ever higher energies is to test the predictions of the Standard Model and search for new physics beyond the Standard Model. There is a large group of LNS researchers currently working on these problems at Fermilab, many of whom will move their activities to CERN within a few years.

The other national high-energy accelerator facility is the Stanford Linear Accelerator Center, located in California. This is an electron-anti-electron collider, with the energies of the colliding beams

tuned precisely to optimize the production of so-called “B” mesons. These particles and their anti-particles, the so-called “B-bars,” are studied in a special purpose detector, elephantine in size, named BaBar. An LNS group plays a central role in this research, which has the goal of studying fundamental symmetries between matter and anti-matter.

Not all particle physics experiments require a man-made accelerator. “Cosmic rays,” primarily high-energy protons accelerated by intergalactic electromagnetic fields, interact with the nuclei of atoms and molecules in the earth’s atmosphere (e.g., carbon and nitrogen). These interactions can produce the nearly-massless leptons known as neutrinos. LNS researchers are studying these elusive particles, along with neutrinos produced by nuclear reactions in the Sun, using a very large underground detector in Japan.

Just as in astronomy, where there are advantages to be gained by placing telescopes above the earth’s atmosphere, enhanced sensitivity to cosmic rays could be achieved by putting a particle detector in space. This was done for the first time by an LNS research group; a massive detector incorporating a large permanent magnet flew on a space shuttle mission in 1998. An improved version of this instrument, using a superconducting electromagnet, is scheduled for a five-year residency on the International Space Station. The detector, along with the liquid helium needed to keep the magnet cold, will be transported to the space station on a shuttle flight in 2007. The principal goal of this experiment is to search for anti-matter in the cosmos. We do not understand why we observe a Universe comprised predominantly of matter, when it is presumed that equal amounts of matter and anti-matter were created in the Big Bang. “Where is all the anti-matter?”

As does the terrestrial neutrino detector, this space-based instrument will look for particles produced by “the great accelerator in the sky.” Although the “beams” are far weaker than those from man-made

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Research at MIT
**Harvard-MIT Division of Health Sciences
and Technology**

Martha L. Gray
Joseph V. Bonventre

FOUNDED MORE THAN 30 years ago, the Harvard-MIT Division of Health Sciences and Technology (HST) is one of the oldest and largest biomedical engineering and physician-scientist training programs in the United States, and is the longest-standing collaboration between Harvard and MIT. From the beginning, HST has focused on breaking down the barriers that can impede interdisciplinary education and on creating an environment that brings innovation from the laboratory bench to the bedside and clinical insight from the bedside to the bench.

Today we live in an era of fundamental change in disease management, including prevention, diagnosis, and treatment. We are beginning to measure and understand individual differences in disease susceptibility and therapeutic responsiveness, and strategies are emerging to “engineer” molecules, cells, and tissues to provide benefit. HST’s research enterprise is poised to make the Division a leader in this quickly-evolving field. Its research program encompasses initiatives based at laboratories at MIT, Harvard University, and Harvard Medical School (HMS), and collaborations involve faculty and resources at area teaching hospitals including Brigham and Women’s Hospital (BWH), Beth Israel Deaconess Medical Center (BIDMC), Children’s Hospital, Dana Farber Cancer Institute, Massachusetts Eye and Ear Infirmary (MEEI), and Massachusetts General Hospital (MGH). And in addition to individual faculty research efforts at these locations, HST research also comprises several centers, including the

HST/Children’s Hospital Boston Center for Biomedical Informatics, HST Division of the Brigham and Women’s Hospital, MIT Clinical Research Center, The Athinoula A. Martinos Center for Biomedical Imaging, The Boston Heart Foundation, The Center for Experimental Pharmacology and Therapeutics, and The Harvard-MIT Biomedical Engineering Center.

While HST students can choose to work in a large number of laboratories doing a broad spectrum of research, HST has decided to focus its research identity in three specific areas: Biomedical Imaging; Biomedical Informatics and Integrative Biology; and Regenerative and Functional Biomedical Technologies.

While HST students can choose to work in a large number of laboratories doing a broad spectrum of research, HST has decided to focus its research identity in three specific areas: Biomedical Imaging; Biomedical Informatics and Integrative Biology; and Regenerative and Functional Biomedical Technologies. It intends to use the leverage provided by the Harvard and MIT collaboration and the marriage of biomedical engineering, clinical science, and medicine to make major contributions in these areas, in each of which HST’s interdisciplinary orientation emphasizes the quantitative and molecular science of medicine and biomedical research.

Biomedical Imaging. With the explosive recent advances in biomedical imaging technologies – many of which were developed by HST researchers – we have a growing capacity to non-invasively

visualize and manipulate molecules, cells, tissues, and organs in ways that were previously impossible. Moreover, researchers are able to investigate chronic conditions such as schizophrenia, arthritis, asthma, diabetes, and obesity, as well as to develop new methodologies for identifying risk factors for disease and to develop new therapies for treating disease. A principal site of HST’s biomedical imaging research

is HST’s Athinoula A. Martinos Center for Biomedical Imaging. Investigators at the Martinos Center have pioneered techniques like fMRI (functional MRI, which takes advantage of MR-observable changes in blood oxygenation to infer neural activity) which are now used world-wide for neuroscience research. Work at the Martinos Center uses (and develops) advanced imaging technology, including MRI, MEG (magnetoencephalography), PET, and optical imaging to identify and characterize normal and abnormal function and to identify novel biomarkers of disease.

Biomedical Informatics and Integrative Biology. The striking advances of recent years in biomedical science and technology, e.g., genome data, protein structure, high resolution images at molecular and organ system scale, and population databases, have been attributable in large part

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Harvard-MIT Division of Health Sciences
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to the ability of scientists to measure, organize, and analyze large volumes of data. HST research emphasizes combining data and knowledge resources in a variety of biomedical science domains and making connections across a range of biological scales – from genes and molecules (genomics and proteomics), to tissues and organ systems (molecular and macro-level imaging), to the living individual (healthcare practice), and to whole populations (epidemiology, health services research, public health, and population genetics). With two major NIH training grants and research programs in this emerging field, HST is at the forefront of biomedical informatics and integrative biology research.

Regenerative and Functional Biomedical Technologies. HST researchers apply the rigors of the physical sciences to the harnessing and engineering of tissues, cells, and molecules. HST's objective in its work in functional biotechnologies is the cost-effective replacement of cell, tissue,

and organ functions. A principal site of this work is the Harvard-MIT Biomedical Engineering Center, located in the heart of the MIT campus. With recent advances in the realm of nano- and microscale engineering, it is possible to precisely design and control systems at length scales comparable to biological cells and molecules. HST investigators are developing technologies leading to better understanding of biological phenomena and to the facilitation of diagnosis and treatment of disease. One of HST's major contributions in this area has been the development of drug eluting stents, programmable implantable devices that sense changes in local tissue or blood environments and respond in a "smart" way to deliver the appropriate amount of agent.

As We Look To The Future

It is widely anticipated that the emerging biomedical technologies, such as genome sequencing, biomedical imaging, tissue engineering, and nanobiotechnology, through the advance in technology and know-how, will give rise to an unprecedented leap in biomedical science and

transform our approach to human health. Realizing and capitalizing on that potential is strongly linked to the educational paradigms that provide students with detailed knowledge of biology, engineering, and medicine, and comfort in their respective cultures. Currently HST enrolls more than 420 students in its eight graduate degree programs, all of which involve an integration of science, engineering, and medicine (and in some cases business), many of which are funded by NIH training grants in the focus areas outlined above. With programs like these and others at MIT, together with the enormous biomedical and clinical enterprises in the Boston/Cambridge area, the opportunity for profound advances has never been better. ■

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accelerators, at least they do not have to rely on federal funding for their operation!

Although, as I said previously, single quarks do not exist in ordinary matter and free quarks cannot be observed in the laboratory, we believe that just after the Big Bang temperatures were sufficiently high for matter to consist of a "quark soup" that had not yet condensed into hadrons. Is there any possibility of observing this state of matter without time-traveling back to the Big Bang? The answer is "yes," if we could reproduce the required high temperatures in the laboratory. This has now been

accomplished at the Relativistic Heavy Ion Collider at Brookhaven National Laboratory on Long Island. Instead of accelerating electrons or protons, one takes atoms of a heavy element, such as Gold, strips them of their electrons (hence, "heavy ion"), accelerates them to very high (i.e., "relativistic") energies, and collides them with another high-energy Gold beam. One of four experiments at this facility is led by an LNS group, and recent data indicate that the conditions for creation of the "quark soup" have indeed been met. The "energy frontier" for heavy ion physics currently resides at Brookhaven, but in a few years it will also move to CERN, and the LNS researchers will follow.

Theoretical Research in LNS

As stated previously, LNS includes the Center for Theoretical Physics (CTP), in which the mathematical underpinnings of the physics discussed above are investigated. The activities in the CTP actually go beyond the theoretical study of nuclei and particles, to encompass, for example, cosmology, field theory, string theory, quantum gravity, and quantum computation. This far-ranging research program will be the subject of a future *Newsletter* article. ■

June L. Matthews is Professor and Director, Laboratory for Nuclear Science. She can be reached at matthews@lns.mit.edu.

LGBT Issues

Lorna Gibson

FROM A GRADUATE STUDENT IN ENGINEERING:

“Can I be bisexual and a faculty member? I know of only 3 gay, lesbian, bisexual or transgendered faculty in the science and engineering departments, and only recently came to know them. I wonder whether the academic environment does not hire ‘out’ LGBT faculty. I don’t wish to have a job where I must be silent about other aspects of my life. Although academia is often a liberal environment, the lack of ‘out’ LGBT faculty seems to suggest that there is a problem with being LGBT and faculty. Some companies I have been exposed to through Alumni activities have a more visible and supportive work environment than what I see at MIT.”

This fall I joined the Lesbian, Bisexual, Gay and Transgendered (LGBT) Issues Group Steering Committee as the faculty representative. The mission of the group is to create a more inclusive and welcoming campus community for lesbian, bisexual, gay, transgender, and questioning and friendly individuals with a primary focus on students. The goals of the group are to:

- ensure appropriate resources are readily available;
- foster campus-wide dialogue;
- enable opportunities to celebrate our community; and
- encourage participation and collaboration.

Past accomplishments of the LGBT Issues Group, working with other student LGBT groups, include:

- “You are Welcome Here” campaign, with over 500 signs hung by faculty and staff to demonstrate their commitment to supporting MIT’s LGBT community;
- Events for Coming Out Week in October – this year these included the Rainbow Reception and “Being LGBT and at MIT: A Collection of Photographs” in Lobby 10;
- *Lavender Guide*: a resource for LGBT

students describing support groups, hotlines, community groups, health issues, e-mail lists, MIT policies, etc.

Faculty participation in LGBT initiatives and student life has been weak. As part of an effort to bring LGBT faculty together and to increase LGBT faculty-student interactions, the LGBT Issues Group is organizing a series of social events (lunch or wine and cheese recep-

As an institution, MIT has been supportive of the LGBT community. The non-discrimination policy includes sexual orientation. MIT has provided domestic partner benefits since 1993. The Institute provides financial support for LGBT events and space for the Rainbow Lounge, a meeting place for the LGBT community.

tions) for LGBT faculty. The first of these was held last spring, with eight faculty attending, mainly from SHASS. There are very few out LGBT faculty in the other four Schools: my own informal inquiries have so far identified only three, other than myself. I am the only out faculty member in the School of Engineering that I know of. Students are

concerned about the lack of role models. The lack of out LGBT faculty sends a message to students that it is not acceptable to be out on the faculty. This is especially discouraging for graduate students considering academic positions.

How can LGBT faculty be more visible?

- add a “You are Welcome Here” card on your door;
- if you are partnered, add a picture of your partner around your office;
- attend the Rainbow Reception or the ‘Tute Gay Ice Cream Friday (TGIF) at 4pm on February 6, 2004 in the Rainbow Lounge (50-306);
- add your name to the LGBT Issues Group and/or one of the student groups to be aware of events on campus;
- let the LGBT@MIT staff in the Rainbow Lounge know that you can be refer-

enced as an “out” faculty member if a student is looking for a specific contact for something related to your field;

- offer to attend one of the LGBT student meetings to talk about being LGBT and a faculty member at MIT;
- add a personal Web page linked to your lab’s Web page, with LGBT-related links (e.g., <http://web.mit.edu/lbgt/>)

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LGBT Issues

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Straight faculty can be supportive by attending LGBT events and being vocal in support of LGBT issues.

Another related issue is the isolation of the LGBT faculty. The LGBT Issues Group will be organizing another social event for LGBT faculty in the spring term. If you are interested in joining us for the social, or in supporting and participating in

LGBT events, please contact Rick Gresh (who organizes the LGBT Issues Group) at rgresh@mit.edu. Rick also maintains the lgbt-faculty@mit.edu mailing list for discussion and communication among LGBT faculty at MIT. The membership of the list is confidential and only members can post to the list.

As an institution, MIT has been supportive of the LGBT community. The non-discrimination policy includes sexual orientation. MIT has provided domestic

partner benefits since 1993. The Institute provides financial support for LGBT events and space for the Rainbow Lounge, a meeting place for the LGBT community. On a personal level, I have found my colleagues to be supportive. In coming out, one of my fears was that my students would find this difficult to accept; this has never been an issue with any of them.

In spite of this laudable institutional support, there are issues that concern me. Over the last few years, there have been a

Trans at the Institute

John Southard

JUST A FEW YEARS ago I “came out” as a classic, lifelong cross-dresser. I’ll spare you the details of how that came to be, but I’m on a mission, and I want your attention. I suspect that I now have it.

Because I myself could have used some such mentoring when I was an MIT undergrad long ago, I signed on for being an e-mail mentor to transgendered students and staff, thinking that this would be one of my final contributions to the Institute. But I was sadly disappointed: no one ever responded.

I started to participate in the LGBT (Lesbian, Bisexual, Gay and Transgendered) Issues Group, an informal group, not graced with the official Institute title of “Committee,” hoping to make contact with some of the many transgender people I am sure are out there in the MIT community. Involvement in the LGBT Issues Group has been a rewarding experience, but still I have learned of the existence of (let alone gotten to know) only a scant handful of trans people at MIT.

For those of you who are not familiar with the trans world, there are widely considered to be three categories: (1) trans-

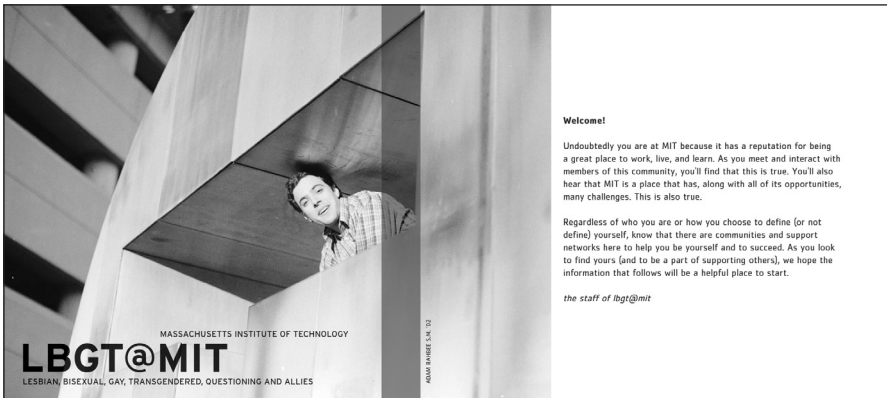
sexuals: persons who believe their gender to be different from their biological sex, usually from birth; they may or may not ever make the transition; (2) cross-dressers, more commonly termed transvestites in other parts of the world, who derive comfort and satisfaction being in a mode of dress and behavior associated with the opposite sex while being otherwise unremarkably “normal”; and (3) drag queens: men, usually gay, who perform before audiences as women, often breathtakingly decked out. The boundaries, if there are any, are fuzzy and complicated. I am risking oversimplification here.

Where are they? Little is known, for what I suppose are obvious reasons, but figures ranging from one percent to five percent of the general population are widely cited. In terms of the MIT student body, that means perhaps hundreds. In terms of the MIT faculty, that means perhaps tens. Most are probably in the closet, or in denial. And many of them, especially students, are at risk. My experience is that suicide is constantly in the back of the minds of transsexuals. Public

consciousness of transgenders lags far behind that of gays and lesbians, who have made great strides in recent years (with far still to go). Transgenders, by their very nature, tend to be unto themselves. There continues to be progress, however: The LGBT Issues Group has convinced MIT, in the past year, to include “gender identity” in its anti-discrimination statement.

I resolved to write this piece with the hope that I can galvanize faculty who are transgendered (you are out there, I am sure) to enter into a kind of mutually supportive community, even if “outness” is not a possibility. Maybe that is an unrealistic hope, but if I could reach just a few of us, it would be worth the effort. Lunches for LGBT faculty, organized by Rick Gresh (rgresh@mit.edu) have been a big step forward; there will be two more later this academic year. But aside from that: for you trans people out there, if the shoe fits, I would be pleased to hear from you. ■

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Spread from "Free2B" brochure recently published by LBGT@MIT

number of large research projects with major involvement of faculty in the School of Engineering (e.g., Singapore-MIT Alliance, DuPont-MIT Alliance, Cambridge-MIT Institute, Institute for Soldier Nanotechnology [sponsored by the U.S. Army]). In engineering, these large group projects are becoming increasingly important in obtaining research funding. Last spring and summer I was asked to consider participating in the renewed Singapore-MIT Alliance and in the Technology and Development Program's educational collaboration with the Malaysia University of Science and Technology. Both countries have particularly oppressive policies towards gays. In Singapore, the maximum penalty for homosexual conduct is life in prison. LBGT e-mail lists are illegal. The government does not allow the formation of LBGT groups. In Malaysia, the maximum penalty for homosexual conduct is 20 years in prison and whipping.

I have decided that I cannot participate in these programs. I've discussed this issue with several colleagues, and some feel that this is my choice. However, other faculty are not put in the position of making a choice to participate in programs with a sponsor that imprisons people like them.

This issue raises a broader policy question: Are there any limitations on institutions, organizations, or countries that

MIT will do business with? As a hypothetical instance, if a foreign company had a policy against hiring Blacks, would MIT

This issue raises a broader policy question: Are there any limitations on institutions, organizations, or countries that MIT will do business with? As a hypothetical instance, if a foreign company had a policy against hiring Blacks, would MIT enter into an agreement with that company?

enter into an agreement with that company? MIT does have a policy regarding use of outside facilities (12.5.4 in *Policies and Procedures*), which states:

Official Institute business is occasionally conducted in private clubs outside the Institute. Some private clubs have discriminatory membership policies or practices. Consistency with the Institute's long-established policy of nondiscrimination requires that no member of the MIT community be placed in the position of having to participate in an official MIT function at a place where he or she would not be welcome as a member. In keeping with this policy, it is inappropriate for official MIT business or social functions to be conducted at Institute expense in clubs having discriminatory membership policies.

Is it MIT's policy that it is not appropriate to have MIT functions at clubs that discriminate but that it is appropriate to

have collaborations with countries that do?

MIT's policy on ROTC has been developed to alleviate issues associated with discrimination by the U.S. military against homosexuals. It has been described as one of "tight embrace" (Professor Michael Piore, "Gays and ROTC," *MIT Faculty Newsletter*, September 2003). The philosophy is one of ensuring that any homophobia within ROTC does not spill over into MIT, but rather, that MIT's open and tolerant academic culture permeates ROTC. While ideally I would like to see the U.S. military's policy on homosexuality change, I agree with Professor Piore that MIT's ROTC policy is "a practical accommodation to the Congressional threat to cut off

all military funding to universities which severed connections to ROTC."

Would it be possible to approach MIT's interactions with countries or institutions with oppressive policies towards any group in a similar manner with the goal of engaging the country or institution to move towards a more tolerant society? One action that MIT could take would be to insist on a discussion of our own non-discrimination clause as part of the negotiations of future contracts and to require the country or institution to accept all students, staff, and faculty at MIT as participants in the project. Clearly, this is not a simple problem and further thought would have to be given as to how MIT might pursue this. ■

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Making the Most of E-Mail: Popular Services, Recent Changes

Theresa Regan

E-MAIL IS NOW SUCH an integral part of daily life at the Institute that it may seem predictable and mundane. A lot goes on behind the scenes, however, to maintain and enhance MIT's e-mail system. Information Systems (IS) supplies the technical expertise, servers, and other infrastructure resources to handle the remarkable flow of e-mail in, across, and out of MIT. IS also responds to customer requests for e-mail service enhancements and to a variety of security issues.

In the last several months, IS has introduced several enhancements and changes to e-mail at MIT. Popular services include spam screening, auto-responder (vacation e-mail reply), a more robust implementation of MIT WebMail, and iPass. On the security side, IS has established a new policy prohibiting the distribution of executable e-mail attachments, which can unleash viruses and worms, and now supports the use of secure SMTP (Simple Mail Transfer Protocol) authentication for outgoing mail.

Please note that these services and security measures are provided for mail sent through central, IS-supported mail servers or received by IS-supported post office servers (i.e., po9, po10, po11, po12, or po14) – that is, for mail addressed to and from *user@mit.edu* (and not, for example, *user@sloan.mit.edu* or *user@yahoo.com*).

New E-Mail Options at Your Service

In response to customer requests, IS has added three e-mail-related services and an Internet access service to its offerings.

- **Spam Screening** gives users of MIT e-mail the option of screening incoming messages for unsolicited, unwanted junk e-mail. MIT Spam Screening performs a series of tests on an incoming e-mail message and scores it according to a set of criteria. Users can then optionally filter messages that qualify as spam.

Note: The contents of your e-mail are not being changed or blocked. All e-mail sent to you at MIT will be delivered to

In the last several months, IS has introduced several enhancements and changes to e-mail at MIT. Popular services include spam screening, auto-responder (vacation e-mail reply), a more robust implementation of MIT WebMail, and iPass.

you, even spam – though you can have spam delivered to a special IMAP folder that you designate. You must configure a filter in your e-mail client or create a specific IMAP mailbox for any filtering to happen. If you do not select either of these options, the only change caused by spam screening will be additional headers in your e-mail.

For more information about setting up spam screening, see <http://web.mit.edu/is/services/email/nospam/>.

- **Auto-Responder** lets you set an automatic reply to messages sent to your MIT e-mail address *username@mit.edu* during an absence. It will reply to messages that contain your address in the To: or Cc: line. A great feature of this

service is that correspondents don't get a response every time they send you a message. The auto-responder sends only one message to each sender based on a "wait" period (of one to 31 days) that you can designate.

Activating the auto-responder – which requires an MIT personal certificate – is straightforward. For details, see the Auto-Responder Web page at <http://web.mit.edu/is/services/email/autoresponder.html>.

- **MIT WebMail** provides a convenient way to read, reply to, send, and delete current e-mail using almost any Web browser, almost anywhere in the world. Access to the MIT e-mail servers is secure and encrypted. MIT WebMail has proven so popular that IS recently added a second server to improve performance.

You can access MIT's WebMail installation from <http://web.mit.edu/webmail/>. This Web page provides links to instructions and an FAQ.

- **iPass** offers low-cost remote connections for travelers, enabling you to call a local (or nearby) access number to connect to the Internet and MITnet without incurring long-distance charges.

You must register for the iPass service and download and install the iPassConnect client software. For more information, see <http://web.mit.edu/is/help/ipass/>.

Recent E-Mail Security Measures

Due to security issues and problems related to spam, IS has changed some of its e-mail practices – and there will likely be more changes to come.

- **Executable E-Mail Attachment Filtering.**

The MIT mail system no longer distributes e-mail attachments that self-execute on receipt. (Such e-mail messages have specific extensions, such as .exe, .cmd, or .pif.) This change in policy is in response to the growing trend by malicious hackers to use these attached files to exploit operating system and application security flaws. Executable e-mail attachments can carry worms and viruses that are destructive and fast-moving.

E-mail rejected because of an executable attachment will not be delivered, and a note will be returned to the sender acknowledging that the e-mail was not delivered due to MIT's e-mail operating policy. Distribution of non-executable e-mail attachments, such as Word documents, Excel spreadsheets, and PowerPoint presentations, will continue uninterrupted.

Those who need to exchange executable files should consider alternatives, such as file transfer protocol (FTP). IS supports several secure FTP options, and

A Quick Look at Popular E-Mail/Remote Access Services

SPAM FILTERING: A service to score incoming e-mail and filter accordingly
<http://web.mit.edu/is/services/email/nospam/>

AUTO-RESPONDER: An automated e-mail response service
<http://web.mit.edu/is/services/email/autoresponder.html>

MIT WEBMAIL: A convenient way to handle e-mail remotely
<http://web.mit.edu/webmail/>

iPASS: A low-cost service that provides Internet connections for travelers
<http://web.mit.edu/is/help/ipass/>

You can send questions or comments about any of these services to the Computing Help Desk at computing-help@mit.edu.

more complete information is available at <http://web.mit.edu/is/topics/filetransfer/>.

If you need to exchange any executable files through the MIT mail system, you will now first need to package them (by zip, tar, etc.).

The Mail Hub Attachment Filtering page at <http://web.mit.edu/services/mail/attachments.html> has more information, including a full list of executable extensions that will be filtered.

- **SMTP Authentication.** MIT's outgoing SMTP mail server, outgoing.mit.edu, has been modified to ensure the reliable delivery of authenticated mail. This was done to help guarantee that MIT's outgoing mail server is not misused (e.g., by spammers), which might result in large Internet service providers refusing to accept e-mail from MIT.

At some point in the future, members of the MIT community may need to configure their e-mail clients for SMTP authentication. Information Systems has developed a Web page with instructions on how to securely authenticate your outbound e-mail at MIT. It's at <http://web.mit.edu/is/topics/email/smtp/>.

The Last Word

For a comprehensive look at the e-mail software, services, and support that IS offers, visit the E-Mail at MIT page at <http://web.mit.edu/is/topics/email/>. ■

Theresa Regan is Director, Information Systems. She can be reached at tregan@mit.edu.

OpenCourseWare Update OCW as Knight Errant

Douglas Morgenstern
Margarita Ribas Groeger

OpenCourseWare launches Spanish and Portuguese translations of MIT faculty content

OPENCOURSEWARE IN the language of Cervantes? Ostensibly a Quixotic enterprise, but with the help of Universia.net, this undertaking has been launched successfully.

Universia is a consortium of more than 700 colleges and universities in Latin America, Spain, and Portugal that has translated a sample of 24 MIT OpenCourseWare (OCW) subjects into Spanish and Portuguese. Currently active in nine countries (Argentina, Brazil, Colombia, Chile, Spain, Mexico, Peru, Portugal, and Venezuela) and Puerto Rico, Universia reaches 10 million university and high school students, alumni, teachers, and administrators around the world. OCW's partnership with Universia is a precursor to what OCW hopes will be other collaborative efforts for translation into additional languages to reach audiences in Africa and Asia.

What is interesting about this relationship is that Universia is paying for all the translation work. The organization, headquartered in Madrid, has made a substantial financial investment in the conversion of our faculty content into Spanish and Portuguese, which is a testament to the value the educators at Universia – and thus, their constituency of educators and learners throughout the Spanish- and Portuguese-speaking world – see in free and open access to the MIT faculty's content. The available Spanish (at <http://mit.ocw.universia.net/>) and Brazilian Portuguese translations (<http://www.universiabrasil.net/mit/index.jsp>) already include the following subjects:

- 1.061: Transport Processes in the Environment
- 2.71: Optics
- 6.071: Introduction to Electronics
- 6.170: Laboratory in Software Engineering
- 6.281J: Logistical and Transportation Planning Methods
- 6.542J: Laboratory on the Physiology, Acoustics and Perception of Speech
- 7.012: Introduction to Biology
- 7.28: Molecular Biology
- 7.51: Graduate Biochemistry
- 8.02: Electricity and Magnetism: TEAL/Studio Physics Project
- 11.208: Introduction to Computers and Public Management II
- 12.409: Hands-On Astronomy: Observing Stars and Planets
- 14.271: Industrial Organization I
- 14.33: Economics Research and Communication
- 14.452: Macroeconomic Theory II
- 15.053: Introduction to Optimization
- 15.810: Introduction to Marketing
- 17.871: Political Science Laboratory
- 18.06: Linear Algebra
- 18.996: Topics in Theoretical Computer Science – Internet Research Problems
- 21H.433: The Age of Reason
- 21L.435: Shakespeare, Film and Media
- 24.900: Introduction to Linguistics
- CMS.930: Media, Education and the Marketplace

This January, a second phase of translations will be published for the following subjects:

- 2.96: Management in Engineering
- 6.263J: Data Communication Networks
- 14.27: Economics and E-Commerce
- 15.783J: Product Design and Development
- 17.196: Globalization
- 18.404J: Theory of Computation
- 21A.218J: Identity and Difference
- 21F.019: Communicating Across Cultures
- MAS.450: Holographic Imaging

Early usage data indicates an exceptionally strong interest in MIT's OCW project, with the number of hits, page views, and e-mails making this the most popular of Universia's translation projects, which also offer content from Wharton, Stanford, and *Science* magazine. This phenomenon is remarkable considering the other content has been available for quite some time, while OCW premiered only a few months ago.

Translating into Spanish is always a daunting task, since geography and history have brought about differences among dialects that sometimes offer impediments to the quest for universal transparency. This effort is made even more challenging by the fact that some instances of language, grounded in educational arrangements within the United States and even more specifically, at MIT, can be derived from assumptions that are absent or significantly different in other educational environments. Reading an OCW translation in another

language constitutes an act of interpretation and reflection, both about the culture of MIT and the culture of the reader. Interpretation and reflection ideally can lead to change, and dissemination of knowledge in the service of collaboration and change is one of the core missions of OCW.

How did the OCW team ensure that our faculty's content was being represented in a quality translation? Universia has a team of translators who did the initial translations of MIT materials, and once that first round of translations was completed, a faculty member from a Universia-member institution, who specialized in the particular discipline being translated, did a quality-assurance check of the work. Then, here at MIT, multiple faculty did spot checks of the translations and made some suggestions of how to improve the content – in fact, we were able to change the translations to be more suitable for Spanish speakers in this hemisphere (avoiding use of the Spanish peninsular “vosotros”), based on a suggestion from Professor Rafael Bras, chair of the MIT faculty.

As members of the Department of Foreign Languages and Literatures within the School of Humanities, Arts, and Social Sciences at MIT, we try to engage our students in a continuing dialogue that embraces language, literature, film and other media, art, music, culture, history, economics, and politics. As teachers of Spanish, the majority of whose speakers reside in the developing world, we are

pleased and impressed by OCW's commitment to the educational transformation of developing countries.

MIT educates and is educated by a large proportion of students from all over the world, and even before OCW, was engaged in global collaborative efforts of many kinds. Some of our students study abroad for a summer or a semester, and others perform volunteer work internationally. We are gratified to be part of OCW and thus share our ideas on teaching language and the humanities with other educators, and of course, receive feedback from them.

But we are equally excited to see that by embarking on an impressive and long-range OCW translation project, the Institute is demonstrating its commitment not only to help design and construct windmills as an alternative energy source, but also to take on, with abundant intellectual and electronic energy, the virtual windmills of educational global transformation in a manner that surely would have amazed and delighted Don Quixote.

If you would like to participate in OCW, please contact Jon Paul Potts, the OCW communications manager, at jpotts@mit.edu or 2-3621. ■

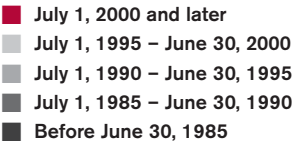
Douglas Morgenstern is Senior Lecturer, Foreign Languages and Literature. He can be reached at dmorgen@mit.edu. **Margarita**

Ribas Groeger is Director of the Spanish Program, Foreign Languages and Literature. She can be reached at mgroeger@mit.edu.

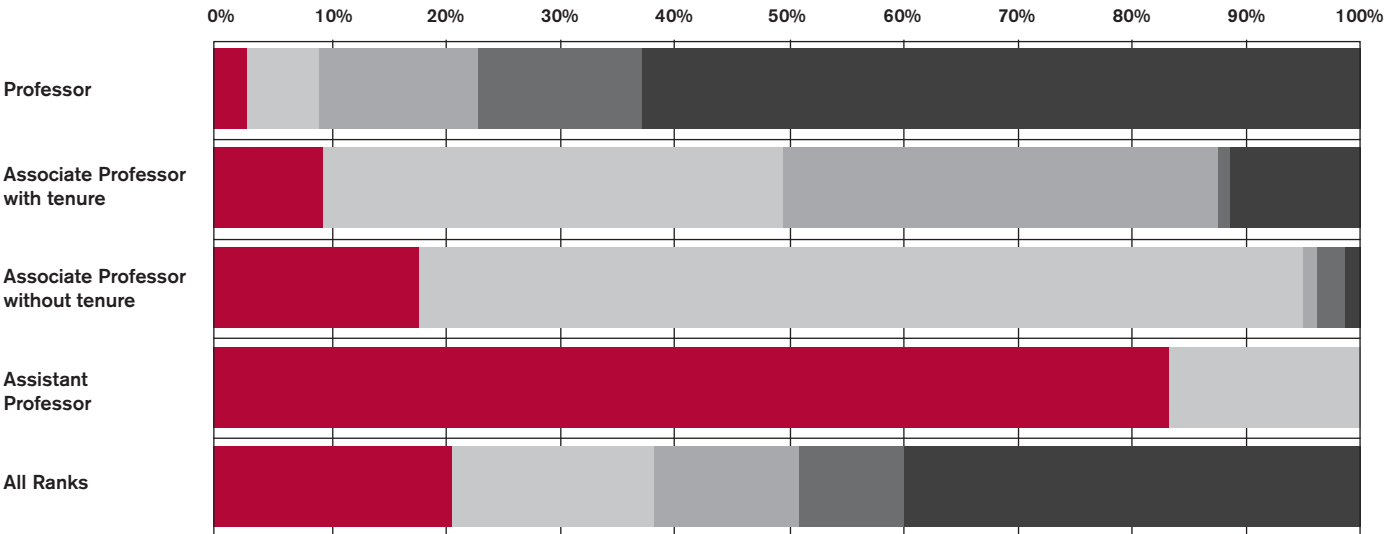
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M.I.T. Numbers

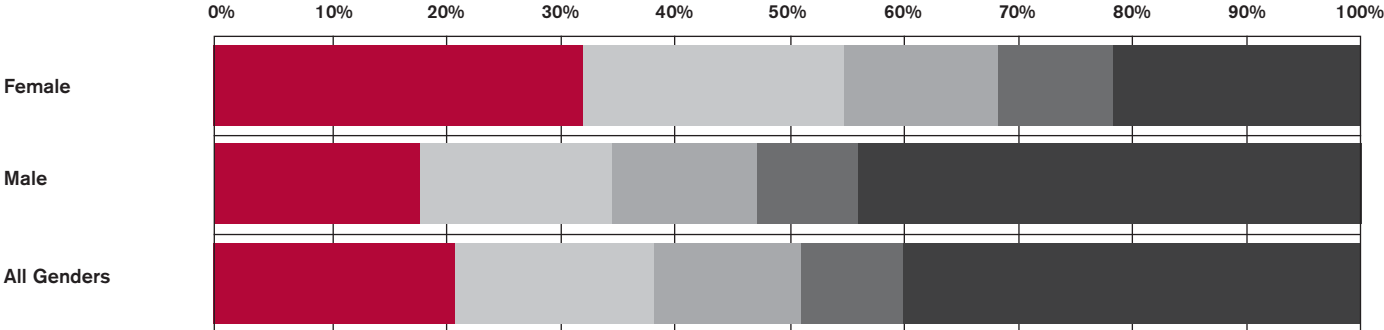
Individuals Appointed to the Faculty (1985 – Present)



Appointments By Rank



Appointments By Gender



Source: Office of the Provost