

MIT Faculty Newsletter

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

in this special double issue we feature an article by the Dean of Engineering, "Engineering Excellence in Challenging Times" (page 6); an interview with the Director of MIT Medical concerning repercussions of their budget cuts (page 10); and "The Moral Moment: Departing Words from the Outgoing Faculty Chair" (page 16).



MIT Medical

Tom Kochan New Faculty Chair

Newsletter Staff

THOMAS A. KOCHAN WILL take up his duties as Chair of the Faculty this June after a year of apprenticing under outgoing Chair and good friend Bish Sanyal. Since Tom's field is work and employment, he appreciated the opportunity to get a realistic job preview while "in training" this year as the faculty officers worked through a full plate of issues.

Kochan is the George M. Bunker Professor of Management and co-director of the MIT Institute for Work and Employment Research. His interest in how work gets done started early in life, growing up on a dairy farm in Wisconsin. Now when he finds himself up early in the morning working in front of his computer, he is reminded that one of his early goals in life was to get a job that didn't require him to get up before dawn on cold winter mornings to go out and milk cows.

continued on page 5

Teach Talk Rethinking the Math Core

Michael Sipser

IT NEVER HURTS TO REMIND ourselves that MIT has the greatest students in the world, and that we have a profound obligation to give them an equally great MIT education. For the past few years the MIT faculty has been engaged in a process of reevaluating the undergraduate program. The Mathematics faculty, a participant in this important process, is reviewing its own course offerings. Mathematics subjects are a central feature of the General Institute Requirements. It is time once again to revisit these basic but nontrivial questions: What mathematics should all MIT undergraduates learn? How best do we teach it to them?

The Mathematics Department is reexamining the core undergraduate mathematics subjects. The scope of this effort will include the basic freshman calculus GIR sequence 18.01 and 18.02 along with

continued on page 20

Editorial Should One Size Fit All?

THE PRECIPITOUS DECLINE OF the financial markets has taken its toll on college and university endowments across the country. MIT has not been immune to this affliction. Following early announcements to the contrary, the MIT administration has frozen faculty salaries above a threshold minimum, laid off personnel, and required departments, labs, centers, and administrative units from Building Services to MIT Medical to cut their spending by 5% each year for the next three years.

A detailed financial justification for these decisions has not been forthcoming and is unlikely to emerge in the near future, if ever. Widespread, systematic faculty involvement in the decisions seems to have been lacking, although there is anecdotal evidence that faculty were in some manner consulted prior to

continued on page 3

contents

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	01	Tom Kochan New Faculty Chair Newsletter Staff
Teach Talk	01	Rethinking the Math Core Michael Sipser
Editorial	01	Should One Size Fit All?
From The Faculty Chair	04	Distrust of Educational Innovations Bish Sanyal
	06	Engineering Excellence in Challenging Times Subra Suresh
	08	Leadership Skills for Science and Engineering Faculty Charles E. Leiserson
	10	Interview with Director of MIT Medical Dr. William Kettyle
	15	Update on the Faculty Renewal Program Douglas Pfeiffer
	15	Newsletter Adds Two Board Members
	16	The Moral Moment: Departing Words from the Outgoing Faculty Chair Bish Sanyal
	18	MIT Faculty Vote to Make Their Articles Openly Available Hal Abelson, Ann Wolpert
M.I.T. Numbers	19	The Federal Research Dollar on the MIT Campus
Teach Talk	22	TA Training Bootcamp Reinforces Curriculum Innovations and Improves Recitation Experience in Freshman Chemistry Course Elizabeth Vogel Taylor, Rudolph Mitchell, Catherine Drennan
	25	MIT Faculty Work/Life Website Created
	25	MISTI Launches Call for Second Round of Global Seed Funds Proposals
Arts & Humanities at MIT	26	Laughing Together West Garage
	28	Bernard M. Gordon-MIT Leadership Program: Developing Engineering Leaders of Tomorrow Edward F. Crawley
Letters	30	The Need for Interdisciplinary Education Anne EC McCants
	31	MIT 150 Exhibit to Celebrate Institute's 150th Birthday
	32	The Future of Medical Care?

Photo credit: Page 1, David Lewis; Cartoon, Page 32, Jennifer DiMase

Should One Size Fit All?
 continued from page 1

some of the actions taken. A gigantic task force of over 200 individuals has been assembled to gather information and help mitigate what are likely to be dire consequences of the decision to cut the operating budgets of all units by 15% over the next three years. Most units have been able to absorb the shock for the first year, but in planning for future years some draconian measures will need to be taken that are likely to affect the quality of life for faculty, students, and staff for many years to come.

It is politically easiest and temporally most expeditious to apply the cuts equally across all units, but we ask, should one size fit all? In the current issue of this newsletter we report a most interesting discussion with William Kettyle, M. D. and Medical Director at the Institute. MIT Medical is in many ways just like MIT academic departments, with 73% of its annual budget supporting personnel, 15% drugs (equivalent to essential materials in departments), and the remainder supplies, or “tongue depressors” in Dr. Kettyle’s words. MIT Medical’s annual budget of \$80M will be shaved by that 5% in FY10, the consequences of which are discussed in the interview with Dr. Kettyle beginning on p. 10 of this issue. Some of this information has appeared on the Website of MIT Medical, but may not be familiar to most of our readers.

The task force group under “Administrative” with the subheading “Human Resources and Benefits” is responsible for oversight and decisions concerning the way in which Dr. Kettyle and his team at MIT Medical will meet the demands of future cuts of 5% per year going forward. We were impressed with the creative solutions that this team has advanced to generate revenue by expanding its services to non-MIT Health Plan, Institute, and even local community residents and workers to stave off the impending disaster that might occur were MIT Medical to continue to lay off personnel, give up more salary lines, and shift its services to more costly and most certainly less convenient off-campus

units. This example should serve as a beacon of light for DLC administrators.

But not all DLCs would be able to respond in this manner nor should they. As graphically demonstrated numerous times in this newsletter over the past years, the growth in administrative salaries and positions has been significantly greater than that of faculty lines. It is the faculty who generate revenue for the Institute, through tuition as teachers, through overhead as researchers, and through international and other programs such as ILP that bring in real dollars. If one size should not fit all then, we ask, why should there not be a serious administrative reorganization that would lead to a significant reduction in administrative lines, salaries, and overhead? What part of the task force is charged with that chore? There is a subheading entitled “Administrative Processes” which, we urge, should address this option in a serious manner. The other subheadings of Human Resources and Benefits, Procurement at MIT, and IT at MIT will have a similar opportunity to recommend reductions in administrative overhead. We urge them to consider such action, rather than, for example, reducing benefits which have already eroded significantly over the decades. Do any of you remember \$7 per year annual parking fees and \$800 annual travel allowances for faculty to attend meetings?

The Provost’s Office kindly provided us with the personnel counts summarized in the table shown below:

	1995	2007	Growth	% Growth
Faculty	954	998	44	5%
Administrative Staff	1301	1886	585	45%
Academic Staff	2224	3794	1570	71%
	4479	6678	2199	49%

Academic staff is a catchall category that includes teaching staff – Lecturers, Instructors, Adjunct Faculty, Professors of the Practice, Retired Faculty, Professors without Tenure, Retired Faculty, Visiting Faculty, Visiting Lecturers, Visiting Instructors; scientific staff – Senior Scientists/Engineers, Postdoctoral Associates, Research Fellows, Affiliates; – and, lastly,

Academic Administrators. Administrators and academic staff have grown dramatically in both absolute number, 45% and 71% respectively, and relative to permanent faculty (5%). Our view is that, as a matter of principle, the pain of reductions in staffing and overhead allocation should fall more heavily on employment categories that have experienced explosive growth unless a convincing counter-argument can be made. A fair and reasonable strategy for cutbacks must be based in part on accurate labeling and accurate counting. Administrator and academic staff categories should be refined into operational sub-categories that accurately reflect contributions to Institute welfare.

There is hope that the financial markets will rebound to the extent that the MIT plan of 5% cuts per year in FY11 and FY12 will be mitigated, but we cannot count on that. Now is the time for creative thinking, like that of Dr. Kettyle. We are pleased to note that revenue generation is a subsection of the task force and trust that they will advise the administration on new sources of income other than taxing faculty grants and contracts in some direct or indirect manner. It is critical that we continue to find funds to attract and support new faculty; to match research grants requiring such; to stop the erosion of the quality of life and learning not only for students but for faculty as well; to provide services that keep the Institute buildings and grounds well maintained, the finances well managed, the grants and contracts units competently staffed, the

health of our community affordable, convenient, and professionally tended; and by no means least to provide the best education at the undergraduate and graduate levels that defines MIT as one of few very top U.S. institutions of higher learning.

Hard decisions will need to be made in the coming months in order to navigate the Institute through the troubled financial waters that affect most institutions worldwide. We urge that “one size fits all” no longer be the mantra as we go forward. ■

Editorial Sub-Committee

From The Faculty Chair

Distrust of Educational Innovations

Bish Sanyal

BY A VOTE OF 81-69, faculty in attendance at the February 4 special faculty meeting supported the motion to restructure the General Institute Requirements (GIRs). Breathing a momentary sigh of relief at the support for the motion, the extent of the opposition to the motion tempered my sense of joy at a new educational innovation. Why did so many faculty oppose the motion?

The situation quickly then took a different turn as I was reminded, rather gently, by Professor Tom Greytak that, since the motion called for changes in the *Rules and Regulations of the Faculty*, its passage required a three-fifths vote of the faculty in attendance, not a simple majority. Gradually the reality sank in that the motion prepared after seven years of work by a large number faculty from all five Schools had, in fact, been defeated. I left room 10-250 in a state that I did not clearly understand; to be sure I was disappointed, having voted in favor of the motion, but still I was appreciative of the need to ensure a broad base of support for any such significant change. Apparently the GIR motion had not been successful in creating that support.

“What could I have done differently?” I asked myself. But after a few days of conversations with faculty on both sides of the issue, I realized that the outcome could not be explained adequately by focusing only on a few individuals who had nurtured the initiative; that there seems to be a general sense of discomfort – even of distrust – of any new educational initiative requiring some reconfiguration of the status quo.

A few examples of what I consider distrust may be useful to ground the discussion about this unpleasant topic. Take, for example, the issue of the “core plus flavor” course option recommended by the Subcommittee on the Educational Commons. Did I perceive a sense of distrust of the motive underlying this recommendation that was intended to simply broaden the offerings and reduce the rigidity of the current curriculum? Likewise, did I sense distrust that courses taught by faculty other than those from the home department of the topic area could not be of high quality? At a time when interdisciplinarity of knowledge is widely acknowledged as necessary for innovation, why this hesitation and distrust – as if some faculty could not be trusted to meet MIT’s high standard of rigorous course offerings?

I could provide more examples, but let me mention only two, one of which actually shook my faith in MIT’s faculty governance system. As evidenced by recent votes at faculty meetings, there seems to be some distrust that quality control of educational offerings cannot be enforced by faculty committees, such as CUP (Committee on the Undergraduate Program) or CoC (Committee on Curricula); that every proposal for curriculum change must be debated on the floor of the faculty meeting even though these meetings are not attended by a large number of faculty. What is the basis of this distrust? Are there examples when the standing committees failed to uphold high standards? Can we not staff these committees with responsible, thoughtful, and experienced faculty members, or do

such faculty not want to participate in the faculty governance system?

As a second example, let me mention that I have sensed skepticism regarding whether or not educational innovations, such as the “design option,” have been thought through sufficiently. True, it is not easy to create rigorous courses that would cultivate sophisticated design sensibilities using multidisciplinary methodologies, but why distrust that it cannot be done? Where is the spirit of joyful experimentation and trust in our own ability to learn from mistakes? Why does distrust of others seem to be gaining ground at a time when what we need is exactly the opposite sentiment – that of mutual trust and collegiality – feelings which are essential for multidisciplinary approaches to problem solving?

I am not naïve enough to think that trust can be restored by simply a change of heart. We need to identify organizational and other material factors that create distrust, and certainly there could be multiple reasons for it. The most obvious one is the fear of change; as if all changes must have hidden agendas to disrupt the way we – the faculty – enforce professional standards. Then, there is the “communication hypothesis”: that somehow the level of communication among the faculty has weakened over time (for reasons not clear to me) and that this is creating distrust. Others have pointed out that the centralization of administration and/or corporatization of governance has fueled distrust. The logic of this assertion is not clear to me, either. I am not talking about trust between the faculty and the administration, but among the faculty.

Perhaps the process by which the GIR recommendations were crafted was not trustworthy? This question is painful for me to even ponder, because I know how much time and effort Bob Silbey as head of the Undergraduate Task Force, and Charles Stewart and Bob Redwine, as heads of the Educational Commons Subcommittee, spent on talking to various departments and Schools. Moreover, all three made a series of presentations at faculty meetings over the past two years, incorporating many modifications proposed by the faculty.

Some faculty have complained that the recommendations were too radical; others that the recommendations were neither strong nor innovative enough. So further amendments were proposed at the February 4 faculty meeting prior to the vote, and these amendments were incorporated into the motion to create a broad base of faculty support. But, still, the motion ultimately failed to muster the three-fifths majority necessary, and we are now back to where we were in 2002 when then-President Charles Vest first charged a special task force com-

posed of 26 faculty from all five Schools to help improve MIT's undergraduate education.

As we struggle to put together the pieces, I am trying to think of MIT not as the proverbial Humpty Dumpty, but as an educational entity with a common purpose and a unified faculty who not only appreciate technological innovations, but educational innovations as well. ■

Bish Sanyal is a Professor of Urban Planning and Faculty Chair (sanyal@mit.edu).

Tom Kochan New Faculty Chair
continued from page 1

With a cup of coffee in hand, he feels he got it half right.

Farm life taught him the value of hard work, cooperation, and community service that have guided his professional life ever since. Small farmers had to work together and help each other out at harvest time and especially in times of personal or family need, while at the same time negotiating with each other and local businesses for fair deals on equipment and services. So it was a natural step for Tom to take up the study of industrial and labor relations in 1969 at the University of Wisconsin, the university where this field was born. At the time, the university was a hotbed of student protests, demonstrations, and strikes. One of Tom's first experiences in labor conflict came with a strike of his fellow teaching assistants: "We were on strike for three weeks, settled for a little less than the University had offered before the strike, but won on principle!"

Research

Kochan began his professorial career in 1973 at Cornell and was immediately thrown into the center of the public policy

debate of the day: how to best resolve negotiations between public sector employees and employers. He organized a team of students and faculty colleagues to study this issue, evaluated an experimental arbitration statute, and, based on their research findings, made recommendations for changes in the law that continue to be in place today.

Since joining the MIT faculty in 1980, his research has focused on ways to update public policies and organizational practices to catch up with changes in the nature of work, the workforce, and the economy. In recent years, he has argued that the social contract that governed employment relationships, i.e., that wages and productivity should move roughly in tandem, has broken down. He believes that a new social contract is needed to put the economy and workforce back on the road to recovery and a sustained, shared prosperity.

Teaching

Tom was recruited to MIT in 1980 to help revive and rebuild the Sloan School's PhD program in industrial relations. He takes great pride in the small, but premier, PhD program he and his colleagues built, having now placed more than 30 gradu-

ates in the top universities in the U.S. and around the world.

After chairing the committee that created the Minor in Management in 2005, Tom got his first exposure to MIT undergraduate teaching. He created a new "People and Organizations" course to teach students how to navigate and be productive in the world of work and organizations they will enter after graduating. He has come to love this course and the interaction with MIT undergrads. It is the one teaching duty he will not give up during his term as Faculty Chair!

Public Service

In his activities outside of MIT, Tom works closely with business, labor, and government leaders, often serving as a mediator or facilitator in specific disputes or on longer-term efforts to build labor management partnerships. His views are often controversial – challenging prevailing practices of both business and labor organizations; but he says that, and his two beautiful little grandchildren, are what keep him young.

Now the question is whether he can apply these skills in rallying the faculty, administration, staff, and students to meet our challenges at MIT. ■

Engineering Excellence in Challenging Times

Subra Suresh

LIKE SO MANY OF OUR peer institutions, MIT is in the process of adjusting to a new economic reality. The Institute has experienced a significant decline in its Endowment and we must adjust. Some reductions are no doubt necessary, but we must make cuts and concessions with a renewed commitment to our core values and principles and in ways that preserve the priorities of the School of Engineering and the Institute we have all worked so hard to build and sustain.

MIT's bloodline of excellence is its faculty members who, in turn, attract and educate excellent students. Keeping the School of Engineering a world leader in research and education means supporting our current faculty – and it means attracting the very best and brightest young faculty to the Institute this year and in the years ahead. Being at the top of our field also means offering competitive support to our graduate and undergraduate students at a time when their need may be at its greatest.

During the last 12 months the School of Engineering has added 20 new faculty members. Currently, 14 search committees are in the midst of evaluating and short-listing finalists from several thousand applications for faculty positions in the School. With these recruitment activities, we are poised to add up to 36 new faculty members to the School of Engineering in a span about 20 months – nearly a 10 percent renewal of the School's entire faculty.

Such a hiring pace is brisk, even by the standards we set for ourselves under rosier economic circumstances, and reflects our unwavering commitment to excellence and intellectual renewal. Our plans for this

hiring process were made collectively, with input from department leadership and from faculty across the School. There was careful consideration of the accumulated need for faculty recruitment over the past few years, the current financial climate, future budget estimates (including those with highly pessimistic projections), as well

as timely, unique, and strategic opportunities to add capacity and intellectual range to our faculty.

This renewal of the faculty represents one of a number of choices we are making, and illustrates why the global financial crisis also provides unique opportunities for some contrarian strategies to further enhance the School's stature. Despite the economic climate, MIT must explore and implement bold new ideas that are innovative and transformational; we need not only to do what we have always done, we also need to do things differently. To make ourselves sufficiently flexible and nimble in the current financial climate (as well as for the years beyond it) my own office has taken a several-fold deeper cut in its operating budget, on a percentage basis, for next year than that of any unit within the School. All the units in the School have been strongly encouraged to prepare for the worst-case budget scenario, which hopefully will not materialize, by imple-

menting greater efficiency and value in all of our activities. At the same time, new ideas for more efficient means of maintaining and achieving excellence are emerging from the faculty-driven efforts that have been set up to address these issues, from department-, School-, and Institute-wide perspectives. The impulse

Despite the economic climate, MIT must explore and implement bold new ideas that are innovative and transformational; we need not only to do what we have always done, we also need to do things differently.

to redefine and reshape the work we do, and to improve the place where we are doing it, is one of the defining features of the School. We are engineers – inveterate thinkers, creators, and problem solvers – and it is precisely these qualities that can provide us with the best solutions.

In the current academic year, the School of Engineering has launched three initiatives – all of which originated from the School's faculty-led planning process. First, in the fall we announced the formation of the Center for Computational Engineering, which aims to expand educational and research opportunities for faculty and students who would benefit from the application of computational methodologies to their work in engineering and beyond. This effort, supported with gifts and endowment providing two graduate fellowships, has already brought together nearly 40 faculty members from across the Institute. In the six months since the Center's inception, faculty from across the spectrum of engineering and

science disciplines have put together several major proposals, and the Center has created new opportunities for interaction and collaboration in education and research for a number of faculty members for the first time.

Second, this year the School launched four faculty searches that will benefit from the widest range of faculty input. These “School-wide” searches are in broad areas – transportation, energy, green technologies, and computational engineering – and the faculty collaborating on the searches come from every academic department in the School. Freed of the departmental structures that, while traditional and efficient, can be somewhat restrictive, these searches have helped us discover new areas to debate, new ways to converse, and, ultimately, new ways to agree (or engage in constructive disagreement). Successful candidates for the School-wide searches will be selected based on the quality of their work and their vision, without *a priori* consideration of their departmental affiliation. I look forward to the outcome of all these searches in the coming months.

Last, in early March – and in collaboration with MIT-Sloan and the School of Architecture and Planning – we announced the new Transportation@MIT initiative. This initiative will draw on faculty from all three Schools and give the faculty new methods and means for collaborating on issues of common interest. A 2008 survey of 1,300 MIT faculty and senior researchers revealed that 338, or 26% of those surveyed, are doing work related to or applicable to transportation. A look at our existing sponsored research revealed that the School of Engineering alone attracts over \$20 million in transportation-related grant funding every year. Like the Center for Computational Engineering, this initiative has already provided a focal point for new collaborations among faculty members from different corners of the Institute. Through Transportation@MIT, we have laid the foundation to create new and unique opportunities for faculty with common interests to work on transportation tech-

nologies and solutions that will have the largest, most immediate, and most direct benefits for the environment and for sustainable mobility. You will be hearing more about this in the coming months.

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The Bernard M. Gordon-MIT Engineering Leadership Program saw its successful launch this academic year. We are most grateful to the faculty colleagues who helped define and shape the various elements of this program aimed at providing improved context-based and project-based learning and hands-on design and leadership experience to our undergraduate students. The inaugural cohort of Bernard Gordon Fellows was selected this year from a highly competitive pool of undergraduate student applicants. [See page 30 of this *Newsletter* for a related article.]

Faculty members from the School of Engineering continue to play prominent roles in defining and shaping major institutional initiatives.

- Engineering faculty have been central to many of the pioneering innovations emerging from the MIT Energy Initiative. They have had numerous successes translating their innovations into technologies, products, tools, and devices that will benefit society. Two School faculty are leading the recently announced federal Energy Frontier Research Centers – the \$19 million Center for Excitonics, and the \$17.5 million Solid-State Solar-thermal Energy Conversion Center.
- The new building for the Koch Institute for Integrative Cancer Research, when it is completed in late 2010, will house the laboratories of 12 engineering faculty

members. Their research activities will influence the thinking and direction of MIT’s pioneering life scientists and others around the world to jointly find – and engineer – a cure for cancer.

- The recently announced Ragon Institute will involve a number of MIT engineering faculty members, in partnership with the Massachusetts General Hospital and Harvard, in a \$100 million research effort to engineer new therapies and clinical interventions for HIV/AIDS.
- Other engineering faculty members have pioneered international research initiatives that offer unique experimental capabilities and research infrastructure. Their work will help bring new approaches to complex problems in such broad areas as infectious disease, environmental sensing, water purification and desalination, clean energy, and transportation through strategic collaborations with colleagues in Singapore, Portugal, and the Middle East.

MIT faculty and students working at the intersections of engineering, life sciences, and medicine have benefited from the Institute’s significant investments in physical infrastructure over the past decade. While much work lies ahead for further strengthening these activities (through, for example, the creation of centralized laboratory facilities accessible to researchers from across the campus), the Schools of Science and Engineering are developing a unified vision and have embarked on a coordinated planning process to meet their goals. However, the development of new, state-of-the-art central laboratory facilities in the physi-

continued on next page

Engineering Excellence

Suresh, from previous page

cal sciences/engineering areas has lagged at MIT. We remain behind as similar efforts at several of our peer institutions proceed. To rectify this problem, a faculty-led team is currently hard at work to crystallize our vision for achieving an even greater impact on the disciplines of engineering and the physical sciences that rely on large experimental facilities. Our goal is to help create unique and centrally supported experimental capabilities that will enable large numbers of faculty members and students to pioneer the next wave of innovations for the coming decades. As a start to our efforts to address this issue, in the coming months we will see creation of

shared experimental facilities along one or more prominent corridors in the main group, thanks to the generosity of alumni donors.

The financial crisis, famously described as “a terrible thing to waste,” has focused the attention of people across the Institute and helped them ask new questions, among them: “Are there greater scales of efficiency in combining centers and cross-disciplinary research units?” Faculty members in different centers are identifying ways to rejuvenate and broaden their research portfolios through enhanced synergies and mergers.

While the stagnant government funding of the past decade gave rise to strong concerns about sustaining adequate support for research, we have seen a noticeable increase in research volume so

far this year. This increase in faculty research expenditures was evident even before Congress passed the stimulus package, which is expected to result in a temporary spike in research support in targeted areas.

The country is now in the process of re-examining and re-formulating its own plan for our collective future – one, we have been told, that will pay special attention to the cultivation and support of current and future engineers and scientists; and therein lies our real challenge. Can the values that drive us provide the tools needed to solve today’s most complex and vexing problems? In a word: yes. ■

Subra Suresh is Dean of Engineering (ssuresh@mit.edu).

Leadership Skills for Engineering and Science Faculty

Charles E. Leiserson

FEW WOULD ARGUE THAT our formal positions as MIT professors motivate our graduate students to work hard on our research projects. Our personal leadership skill – the ability to inspire the people who work for us – also matters. But, what are the skills and behaviors that define stellar faculty leadership? Whereas industry invests in management training for their leaders to address analogous problems, most universities tend to assume that professors are well skilled in the art of leadership with no additional education or training needed.

MIT has been a leader in countering this anachronistic and anti-intellectual

point of view. Since 2002, over 100 MIT faculty and senior researchers have participated in a workshop entitled, *Leadership Skills for Engineering and Science Faculty*, which is taught by management consultant Chuck McVinney (www.mcvinney.com) and me. The workshop will be offered twice this summer on June 15–16 and on July 13–14 as part of MIT Professional Education Short Programs. Chuck and I developed this leadership workshop specifically for people in technical academic settings. The figure (next page) shows the breakdown of past MIT attendees across departments. Participants have included all university ranks from

assistant professors to full professors and department heads. Fewer than five have graded the workshop less than an A.

Participants address the real and human challenges endemic to technical academic groups. How does one give effective feedback? What are the pros and cons of various strategies to resolve conflicts? How should one deal with an unmotivated student? “Tremendously helpful!” said Mechanical Engineering Professor Kimberly Hamad-Schifferli. “I learned many key things essential to running a group and interacting with others that you don’t learn anywhere else.”

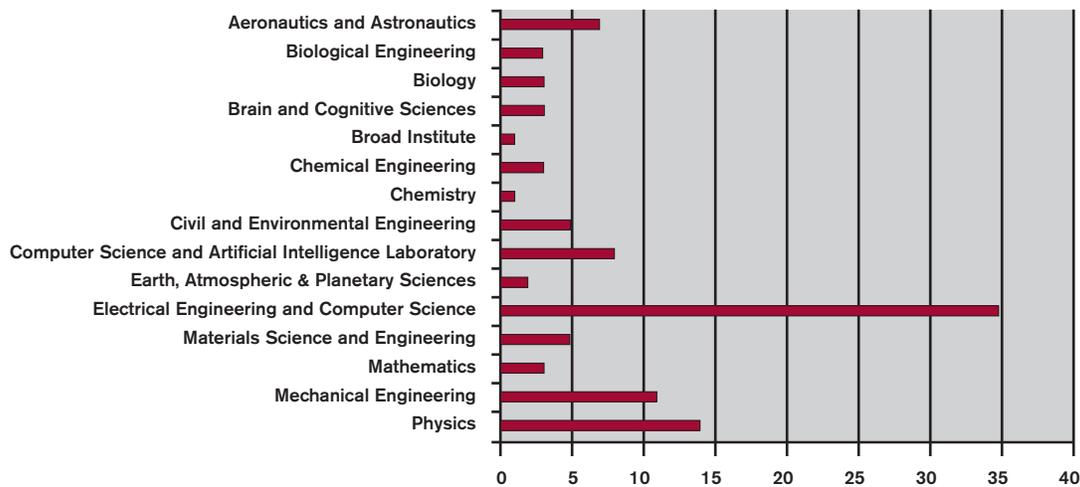
Chuck McVinney explains, “We provide conceptual tools so that participants can dive beneath the surface of the everyday ‘soft skills’ we so often hear about.” Borrowing from learning and leadership models commonly taught in business schools, participants experiment with the concepts in the safe environment of the workshop, engaging in role-playing and other immersive activities. For

of approaches to explore, and provides experiential learning to help them determine what works best for them. Chuck and I encourage participants not to judge styles as good or bad, but rather, which styles work for you and which don’t. The workshop provides a nonjudgmental yet structured environment in which participants can discover their own leadership strengths. “No dogma.”

participants tell me that the time invested in attending the workshop is easily returned in just one semester by avoiding time-consuming miscommunications with students and staff and by applying the lessons in situational leadership to bring students up to speed on projects more quickly.

Although there is a tuition fee for attending a workshop, MIT’s Office of

MIT Registrations for Leadership Workshop 2002–2008



example, a “situational leadership” model helps participants understand how new students can be integrated into a research team without losing motivation. A “mental diversity” model helps participants communicate effectively to disparate audiences about the purpose of their research group’s technical work. EECS Professor Vivek Goyal commented, “I admit I was skeptical, but I was amazed that so much of the material was genuinely universal.”

Because leadership styles vary widely with personality, the workshop eschews “one-size-fits-all” prescriptions. What works for one person often fails to work for another. Instead, the workshop promotes awareness of the participants’ own styles of leadership, offers them a palette

The workshop arose serendipitously. During a leave-of-absence from MIT as Director of Systems Architecture at Akamai Technologies, a local Internet start-up, I met McVinney, who was brought in to help the engineering organization address problems with teamwork dynamics. Mr. McVinney introduced our team to human-centered strategies for engineering leadership. Upon my return to MIT in 1991, I worked with McVinney to adapt these “management” lessons for technical environments within universities.

Over the years, I’ve had the opportunity to talk at many departmental luncheons across the Institute about this workshop. Invariably, someone expresses the concern that they have insufficient time to attend a session. In fact, workshop

Sponsored Programs advises that the cost is eligible for direct charging to a sponsored research project, because workshop activities can be identified specifically with the participant’s particular project and benefits that project directly. In addition, the Dean of Engineering has made two 50% scholarships available for faculty in the School of Engineering. For more information, please consult shortprograms.mit.edu/leadershipskills or contact MIT Professional Education’s Short Programs by e-mailing shortprograms@mit.edu. If you wish to register, you should do so by June 5 for the June session and by July 1 for the July session. ■

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Interview with Director of MIT Medical Dr. William Kettyle

AS WITH THE REST OF THE INSTITUTE, MIT Medical has been hit hard by the economic downturn, being told by the MIT administration that it needs to make budget cuts of 5% per year over the next three years. In a March 26 interview with Medical Director William Kettyle (WK) the *Faculty Newsletter* (FNL) explored what steps have been taken to meet the first year's 5% reduction requirement, as well as Dr. Kettyle's innovative plans for addressing the potential budget reductions in years two and three.

FNL: Thank you for meeting with us. We wanted to try to get a sense of how the budget cut decisions were made at the Medical Center, who made them, and what, if any, faculty input was involved. In addition, perhaps you could address the question of why the Medical Department was cut at all. And, most importantly, what impact the cuts are likely to have on patient care at MIT.

WK: Let me share some thoughts about our approach to the fiscal challenges that we are facing. We can discuss the expense reductions we've made for the next fiscal year, and then we can delve into some of the things we are working on and may propose for the following fiscal years.

Our approach is based on our desire to provide the best care and services for this special community. We will do this in the context of the fiscal environment of the Institute.

The Medical Department is many things to many people – in addition to providing care for students and staff and their families; we play a number of other important roles.

What We Are at MIT MEDICAL

- Student Health Service
- Multispecialty Group Practice
- Hospital
- Pharmacy
- Laboratory
- X-ray Service
- Wellness and Health Education Center
- Urgent Care Center
- Occupational Health Service
- EAP (Employee Assistance Program)
- Environmental Health Service
- “Department of Public Health” for MIT
- Dental Practice
- Insurance administrator
- ...and more

We feel we are a valuable and valued part of the Institute and have an excellent working relationship with the senior administration – something that is extremely valuable given the fiscal stress that we are all facing. We are striving to align services with the needs of our community and with the resources available. In order to find and deploy long-term, resource-conserving, sustainable efficiencies we are, and will be, working closely with colleagues across the Institute.

In the near term, we have been asked to reduce our spending by 5% for the coming fiscal year. We received the same request that the academic departments and administrative areas got – the picture sketched going forward – 5% for 2010 and then an additional 5% for 2011 and another 5% for 2012.

My major concerns are similar to those

we discussed five years ago [see “Interview with Medical Director William M. Kettyle,” *MIT Faculty Newsletter*, Vol. XVI No. 1, September 2003]. We spend 69% of our dollars on people (employees and contractors), about 17% on drugs, and the rest on equipment and support services – what I sometimes refer to as “tongue depressors.” There's a real limit to how much less we can spend on tongue depressors.

We have really put the brakes on pharmaceutical costs. For the last five years we've had an annual increase in expenditures for pharmaceuticals of about 3.7% a year. That's in a world where the rate of increase has been more like 7 to 10% per year. I do not think that we will be able to render any further significant savings in the realm of pharmaceutical expenditures.

The potential cost reducing strategies that might apply to the 14% of our expenses that fit into the realm of supplies and purchased services are very unlikely to render significant decreases in our expenses. Of course, we are working to reduce these costs, but we will need to find other sources of savings.

In order to reduce our expense burden to the Institute, we will need to reduce our work force. Unless, and this is a big unless, we can durably increase our revenue. Selling capacity, where we have it, might preserve the scope and scale of services that we provide.

FNL: When you were told about the need to cut the budget was there any pushback?

WK: The “pushback” is the willingness of our department to work with the Institute

to find a solution, to find innovative ways to maximize the effectiveness of our resources and to craft an approach that provides and preserves excellent care with thoughtful resource utilization. In the short term, for the next fiscal year, we have found ways to decrease our spending that we feel will have a relatively small impact on the services we provide. There are some things we will do differently. We are sculpting and adjusting our services to maximize the use of our resources.

For example, we were carrying about \$500,000 a year in unfilled positions; that number has been roughly the same for the last two or three years. One could make the argument that, since we're getting by without these people now, why do we need to fill those positions.

FNL: *That \$500,000 was part of your budget?*

WK: Yes, but it is no longer.

FNL: *How about last year?*

WK: We didn't spend it. For a number of reasons several positions went unfilled.

FNL: *But could you have spent it on tongue depressors?*

WK: No. In general, salary dollars are not fungible across the budget items. There is some flexibility across line items within our budget, but it's not totally fluid.

FNL: *Specifically, what type of cutbacks have you had to make for this first 5% reduction?*

WK: As I mentioned, the \$500,000 allotted for unfilled positions has been removed from our budget. In addition, several clinicians and administrators will be taking two-week, non-paid furloughs. We have also made plans to close the Inpatient Unit for two months during the summer – we call it summer, but it's really June 15 to August 15. During that time our census has been historically quite low.

MIT MEDICAL Data

- ~25,000 population served (~10,000 students)
- 400 people (employees/contractors)
- 80,000 square feet of space
- 18-bed infirmary
- ~125,000 encounters/year
- Budget: ~\$80,000,000/year
- ~\$40,000,000/year spent to provide services on campus
- ~\$40,000,000/year spent to purchase services outside MIT

FNL: *What happens to those patients, or other people who can no longer go there? Where do they go?*

WK: It depends on the individual's situation. Some patients need care to transition them to home following an illness or operation. During the time the Inpatient Unit is closed we will work to try to help them meet their care needs. Others require supportive care that might be available through other arrangements.

FNL: *What kind of other arrangements?*

WK: Frequent outpatient visits to the department, visiting nurse services, or entering a skilled nursing facility are some of the possibilities.

FNL: *Would they have to pay personally for that?*

WK: It depends on the specific situation, but some might have to pay for certain services personally.

FNL: *But don't people come here to get infusions and things like that?*

WK: During the two months that the Inpatient Unit is closed, we will maintain infusion services and other care services. Overnight stays, however, will not be possible. The summer closing of the Inpatient Unit will also mean that there will not be a doctor on site from midnight until 7 am.

There *will* be coverage on site from 7 am until midnight.

FNL: *Is this decision reversible at this point in time?*

WK: We have begun to make plans to provide the necessary care during the closure of the Inpatient Unit and the reduction in overnight services. We are currently in negotiations with a local hospital and are quite sure that they will be able to provide urgent care services during the night.

FNL: *So it's not reversible, but one can go to the hospital instead of coming here.*

WK: That's correct. Our patient volume from midnight until 7 am, especially during the summer, is quite low.

FNL: *Will you save any money that way? You have to pay the hospital some money for that, right?*

WK: Yes, there will be some new, related costs. However, the overall expenses will, we think, be lower – the costs of staffing – two nurses around the clock and a full dietary staff are significant.

FNL: *And what does that do to the nurses and other staff in the Inpatient Unit? I can tell you from personal experience that they are excellent and extremely dedicated. What does it do to their income if they have to take a two-month, non-paid vacation?*

WK: Let's talk about that component of the situation. You asked if this is reversible? And that's a very good question and something I've thought a lot about. This is something we considered carefully before we made any changes. Most of the personnel changes, although not all, for the coming year are in the form of furloughs – vacations without pay. The jobs in question remain in our system, but we will experience a temporary decrease in salary expenses. So the changes are "reversible" in that they are not destruc-

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Interview with William Kettle
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tive. Furloughing – if I can use that word as a verb – is a temporary way of decreasing expenses while we find more durable, long-term solutions. They buy time. The word “vacation” is clearly not appropriate. A furlough is not working and not getting paid. All employees on furlough will continue to receive benefits, however. Benefits are not shut off.

But for the nurses and the dietary workers in our Inpatient Unit it means two months off in the summer without pay. For some, that means “Gosh, I can play golf every day” or “I can spend the summer with my kids.” But for others it means “Oh my gosh, we were having trouble covering the mortgage payments before this happened. How am I going to keep my house?” That’s the most painful situation. Unfortunately, some may feel forced to seek employment elsewhere. We run the risk of losing nurses and dietary staff who are highly skilled and devoted to our patients and our community.

I’ve spent some time with the nurses and dietary staff, and I don’t know how it will come out in the end. I think it will work out OK for most of them and I hope we won’t be losing people. Still, I realize that it has to be difficult to have an unplanned, unpaid “vacation.”

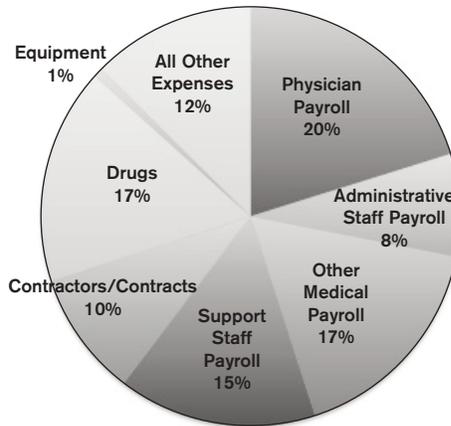
FNL: *MIT’s a pretty good place to work.*

WK: It is an excellent place to work, and we’re hoping that will compensate in some way for the loss of income.

FNL: *In other areas how did you decide who will and who won’t have to take a furlough?*

WK: The decisions were made on a service-by-service basis, taking patient needs, seasonal variations in demand, availability of coverage, and other factors into consideration. There will, for example, be no furloughs in our OB/GYN service. Their demand is high and decreasing staff time would lead to unacceptable cuts in appointment availability.

**MIT Medical Clinical Services
FY2010 Budget**



FNL: *Dermatology I would think would be similar.*

WK: Dermatology is similar. And there are no furloughs in Pediatrics. Each of the internists will take a two-week furlough. The furloughs are being scheduled carefully so that the number of clinicians that are on site at any given time will meet the demands for care.

FNL: *And what about salary cuts? How were those decided?*

WK: There are no salary cuts other than the furloughs. For most of the furloughs, however, it is a functional salary cut.

FNL: *And what about salary increases?*

WK: We’re freezing salaries for everyone with the exception of people who make \$75,000 or less.

FNL: *That’s similar to what it is in the academic and administrative units. That’s for year one?*

WK: That’s for year one.

FNL: *How do you plan to approach the challenges for FY2011 and 2012?*

WK: We are approaching the subsequent fiscal years with energy, with ideas and

with a spirit of cooperation – cooperation with the leadership of the Institute and with our colleagues across the Institute. Why don’t I outline what we are doing.

As you know, a task force – the MIT Institute-wide Planning Task Force – has been established to generate ideas and problem-solving strategies. There are nearly 200 people involved in nine or 10 subgroups. It’s a big group. One of those subgroups is focused on Human Resources and Benefits – medical care issues fit clearly into that group. We also see ourselves as important players in the provision of a healthy and safe environment for our students and will be meeting with the subgroup on Student Life.

My major concerns for fiscal years 2011 and 2012 have to do with the potential transfer of care and costs out of the Medical Department. If we do less here at the Medical Department because of budget limitations, we will be care-shifting and cost-shifting to the outside world – to the medical community around us – where the costs may be lower, the same or, in many cases, I think, higher. The overall cost savings in health care expenditures for the Institute and its employees and students might be very small or, indeed, non-existent.

Each potential shift of care will need to be analyzed carefully to assess the effect on overall health care spending. The quality and integration of shifted care might be fine, but in many areas I suspect it will not be as good or as well coordinated. Contracting the Medical Department may not save the Institute very much money.

FNL: *Didn’t you make a presentation to the subgroup on Human Resources and Benefits a little while ago?*

WK: Yes, I did, about 10 days ago. Basically, what I said was that there is nearly \$200 million spent on health care globally by the Institute community. This large sum is the total spent and includes funds that MIT contributes to employee health insurance; it includes the funds that we, as employees, pay for our portion of the health insurance premium; it

includes the co-pays; it includes the portion of tuition that is earmarked for student health care; it includes money spent for retiree health care.

About \$80 million of that \$200 million comes to the Medical Department – about \$40 million stays here and pays for the salaries, for the contractors, for the drugs, and for the tongue depressors. The additional \$40 million that comes to us really goes through us to pay bills at any one of a number of places where we buy services for our patients.

FNL: *What about reimbursements made by Blue Cross/Blue Shield?*

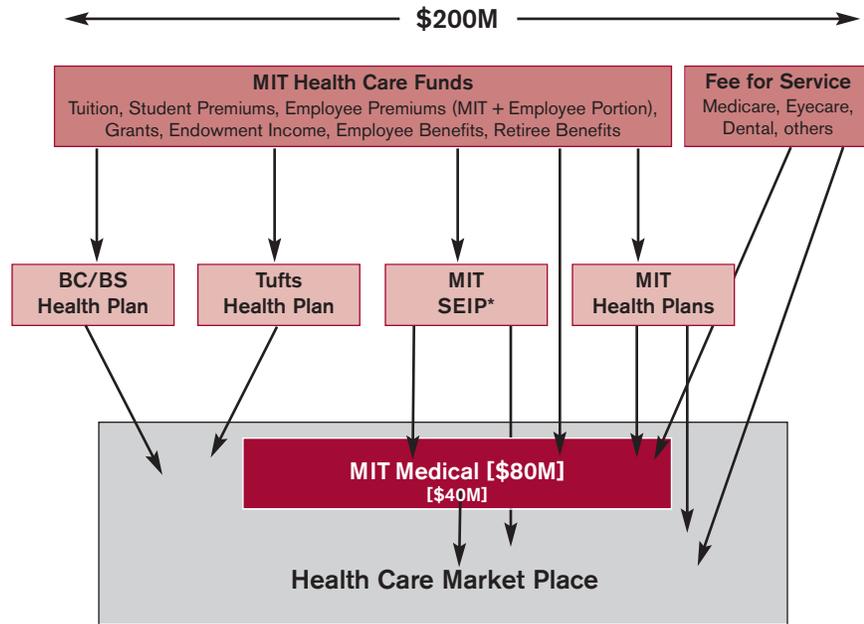
WK: Blue Cross/Blue Shield of Massachusetts plays two important roles in the administration of health care funds at MIT. The insurance programs, managed by the MIT Medical Department, use Blue Cross as an ASO – Administrative Services Only – agent to pay our bills for services obtained by our patients outside the Medical Department. This allows us to take advantage of the preferred rates that Blue Cross has negotiated with providers.

Through separate arrangements with Blue Cross and with Tufts Health Plan, the Institute purchases health care services for employees and their families who are not members of the MIT Medical Department plans. In these cases Blue Cross and Tufts Health Plan also function as ASO agents – again taking advantage of the contracts that these companies have with providers, thereby limiting the costs of care.

FNL: *But does Blue Cross/Blue Shield or some other organization out there actually put any money into the health care of the MIT community?*

WK: No, MIT is self-insured for health care programs. The Medical Department provides care on site and Blue Cross and Blue Shield and Tufts Health Plan provide administrative services that allow MIT to purchase services at discounted rates from medical care suppliers outside the Medical Department.

Where the Health Care Money Goes



*SEIP = Student Extended Insurance Program

FNL: *So if a physician or someone providing care in the community charges say \$100 for some procedure and the patient gets a note saying that \$50 has been allowed by Blue Cross/Blue Shield and the balance to the patient is zero, is it that the other \$50 is collected by the physician, or does somebody else pay?*

WK: In some cases there may be a deductible or co-payment that is the responsibility of the patient. Most of the time, however, because “balance billing” is not allowed in Massachusetts, the provider must settle for the “allowed” amount. So the bill for a \$100 service is deemed to be worth \$50. This is an example of the utility (for the payer, not the clinician!) and power of the contracted network that has been established by Blue Cross. These contracts together with the lack of “balance billing” mean that transactions are settled at amounts that are significantly lower than the “sticker price.”

The Institute rents – actually, that’s the term used in the business – rents those contracts to pay \$50 instead of \$100 for that service. So we get a significantly discounted rate. At MIT Medical we also use Blue Cross as a payment vehicle in order to take advantage of their contracts with area providers. The \$40 million that goes through us goes through us typically via Blue Cross arrangements. We pay Blue Cross an administrative fee; they, in turn, pay our bills and we reimburse them for those payments.

The other \$120 million spent on health care doesn’t come to us or go through us. Some of those funds could be a source of income for the Medical Department. We do have some capacity in some areas – capacity that might allow some of the revenue that is leaving the Institute to remain on campus.

One example is mammography. About two years ago we bought a state-of-the-art mammography machine. The machine is capable of handling ~4,000 mammo-

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Interview with William Kettyle
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grams a year. We currently do about 2,000 studies a year. If we opened up the availability of convenient, on-campus mammography for members of our community who are not members of our health plans, some of the flow of health care funds currently being spent outside of MIT could remain on campus to support our activities.

FNL: I wonder about the size of the Task Force. On the face of it, a 200-person Task Force sounds excessive. But if it can deal with all the different levels of pay that are being cut throughout the Institute in some effective way, then maybe it's a good thing.

WK: Although the Task Force is large, it is well designed, well staffed, and well managed. The range of areas, options, and issues to be considered is huge and I think a large group is necessary. The subgroups are co-chaired typically by a faculty member and an administrative leader. There's been some significant craft put into designing the Task Force and into the selection of the people – these 200 people. I think it will work well.

FNL: And year two and year three are disasters?

WK: I hope not! It will be difficult, but with the help of the Task Force and our dedicated staff I think we will find ways to provide the care and support required to meet the mission of MIT.

Furloughs are clearly a temporary way of reducing salary expenses. They buy us some time while we search for solutions. We have not dismantled services and I hope we will not have to going forward. I think we must durably increase our revenue stream while at the same time work to trim expenses. Sculpting and shaping the services we provide to the needs of our community with the resources available are our current foci. Unless we are able to significantly and durably expand our revenue stream, we

will be forced to make significant cuts in personnel.

The other important thing that's happened over the past few years is the full deployment and development of self-insurance for medical care at the Institute. Self-insurance increases flexibility in the system, and opens options.

We have not dismantled services and I hope we will not have to going forward. I think we must durably increase our revenue stream while at the same time work to trim expenses.

FNL: How do you anticipate MIT Medical responding to President Obama's plans for national health care?

WK: I'm a strong proponent of improving the structure of health care. And I think we, as an educational institution, will be able to find a comfortable position in an improved system of health care delivery.

FNL: As a provider?

WK: Yes. I think that the Medical Department will fit very nicely into some of the proposed approaches. So I'm enthusiastic. I think the Obama Administration's interest in the electronic aspects of providing and managing care is something we have a head start on. Our electronic medical record system and our Patient-On-Line portal are two good examples. In addition, we have highly effective analytic tools that help enhance quality and allow us to monitor expenses.

We have developed "dashboards" which are a very nice demonstration of how technology can improve care. For example, we can now easily determine the frequency of appropriate pneumococcal vaccination in our practice. This can be broken down by provider and, most importantly, the systems allow the provider to "drill" into his or her data and identify those patients needing immunization. Arrangements can then be made to bring the immunization status up to

date. This technology is on my desktop computer and is very easy to use. This is a clear example of technology enhancing care. Similarly, it can be used with other items of care, such as mammograms and colonoscopies; so I am a great believer in the use of information technology – to enhance patient care.

FNL: Information Technology funds haven't been cut in the first 5%?

WK: No, we have not cut funding for IT.

FNL: Anything else you'd like to say?

WK: The situation is very different than it was five years ago.

FNL: Better?

WK: Better. Much better. It feels very different because I think we have a coordinated, cross-Institute planning and evaluation process in place. In addition, at the Medical Department we have a much better, a much broader, and a much deeper understanding of the business basis of our operations. From a fiscal point of view, we understand things much better – something which I think is critical. We've learned a lot.

Most importantly, I think that the senior administration has a keen appreciation of the role and the value of the Medical Department. The approach of looking broadly at the provision of health care and wellness services across the Institute will lead to better care, better health, and better use of our resources.

Thanks for giving me this opportunity to share our progress and our plans.

FNL: Thank you. ■

Update on the Faculty Renewal Program

Douglas Pfeiffer

THE MIT FACULTY RENEWAL

Program was established in 2008 and was designed to offer eligible senior faculty members the option to retire voluntarily with certain incentives, as part of the Institute's overall goal of providing academic departments with opportunities to recruit junior faculty into tenure-track positions. The Program recently completed the application phase for those faculty who were eligible to participate in Year 1 of the Program. Of the 74 faculty who were eligible to participate in the first year, 19, or 26% of those eligible, have elected to do so. Because the program provides flexibility regarding the chosen date of retirement, eight of these first-year participants plan to retire in 2009, and 11 plan to retire in 2010 (though no later than June 30, 2010). Year 1 participants include faculty from each of MIT's five Schools and have a mean age of 72.5.

The Program will be in effect for three years, with the earliest retirements occurring in July, 2009, and subsequent retirements continuing through June, 2012. Faculty members who reached age 68 by June 30, 2008 and who will have at least 10 years of MIT service by their retirement date are eligible to participate. During each year of the three-year program, a dis-

tinct age group of faculty is eligible to participate, as follows (n = number of faculty eligible each year):

Year 1: Those faculty who were 70 and above by June 30, 2008 (n = 74)

Year 2: Those who turn 70 between July 1, 2008 and June 30, 2009 (n = 17)

Year 3: Those who turn 70 between July 1, 2009 and June 30, 2010 (n = 16)

Eligible faculty may choose one of two incentive options offered by the Program:

1. A financial incentive equivalent in value to one academic year salary;
2. Release from regular classroom teaching responsibilities (but with normal research, advising, and administrative obligations) during his/her final academic year preceding retirement, while continuing to receive full pay and benefits.

For purposes of comparison, the average annual number of faculty retirements over the past three fiscal years (2006, 2007, 2008) was 12, keeping in mind that all faculty age 55 and above with at least 10 years of service are normally eligible for retirement under general MIT policy. Therefore, additional retire-

ments beyond those connected with the Faculty Renewal Program are expected for the current year.

MIT previously offered a "Special Retirement Incentive Program" in 1996 that was substantially different from the current Faculty Renewal Program in terms of its timing, eligibility requirements, and incentive structure, so it is difficult to make direct comparisons between the outcomes of the two programs (while also noting that the Faculty Renewal Program will not be completed for two more years). In any case, the 1996 program, which specified 55 as the minimum age requirement, and in which all retirements occurred in a single phase, recorded 79 acceptances out of 299 eligible faculty members, yielding an overall acceptance rate of 26%, the same rate as Year 1 of the current program.

Those faculty who are eligible to participate in the second year of the Faculty Renewal Program may submit an application beginning July 1, 2009. For a full description of the Program's benefits, eligibility requirements, and schedules, please see the Faculty Renewal Program Website: web.mit.edu/facultyrenewal. ■

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Newsletter Adds Two Board Members

THE NEW MEMBERS OF the *Faculty Newsletter* Editorial Board as of this spring are Professors Seth Lloyd (Mechanical Engineering) and George Verghese (Electrical Engineering and Computer Science).

Foregoing the Institute-wide election process initiated last spring, the two new members were welcomed unanimously by the FNL Nominations Committee, chaired by Professor John Belcher. In explaining the reason for bypassing the election

process, Prof. Belcher commented, "There was just the right number of candidates to fill the open positions on the Board."

The new members will officially be added at the Editorial Board meeting later this spring. ■

The Moral Moment: Departing Words from the Outgoing Faculty Chair

Bish Sanyal

HOW DIFFERENT ARE THE TIMES from when I started my term as the Faculty Chair in June 2007 and now, in May 2009, when I am at the end of my term! Unfortunately, the economic landscape now is tattered and in ruins with negative growth rate, rising unemployment, a sharply fluctuating stock market, and shockingly negative endowment returns. Aware that the economic slump may not soon end, Provost Reif has warned that an annual budget reduction of \$50 million for each of the next three years may be necessary. Meanwhile, faculty salaries have been frozen for the year even as the faculty watch, anxiously, the steady drop in their 401(k) earnings.

In contrast, the political landscape has changed for the better from when I started my two-year term. President Obama's election in November 2008, and his new policies with regard to funding for research in science and engineering, have set a new tone of progressive optimism despite the economic gloom. Also, Senators Charles E. Grassley and Max Baucus have been relatively quiet lately in their demand for more spending of endowment funds. Federal financial aid in the form of Pell grants for students from low- to middle-income families is being increased; and the federal government is eager to make low-interest loans more readily available to students to pay for their college education. Also, the U.S. has returned to the community of nations with a new attitude of cooperation and leadership in collective problem solving for a host of interconnected problems, ranging from reduction in carbon emissions to the regulation of speculative

financial flows across the world. No longer the target of global criticism, in fact the moral standing of the nation is on the rise, because a majority of the American people have demonstrated that they are able to transcend racial prejudice in the hope of prosperity, peace, and equal access to opportunity.

What should be the role of research universities during this time of economic gloom and political hopefulness? Echoing the sentiment from America's corporate boardrooms, some have proposed that the economic crisis could be turned into an opportunity for innovative restructuring of educational practices. The goal, in this line of thinking, is to retain the financial viability of universities by consolidating their operations, reducing costs of all kinds, both for the universities as well as for the students. The stimulus package, proposed by President Obama and approved by Congress, has created some optimism for an eventual rise in research funding, but, on the whole, there seems to be a growing consensus that universities must follow the paths of private firms to remain in business: New products need to be made for old markets while keeping a keen eye on opportunities for new markets, locally as well as globally; the efficiency of production must be enhanced and distribution costs reduced by fully incorporating the advantages offered by new communication technologies; and increasing shares of the costs of research and teaching must be recuperated from private firms, governments, and individuals who have so far managed to reap the benefits of new knowledge while shifting the costs to the universities.

I do not underestimate the current economic strains impacting leading research universities, such as MIT, and I hope that the various task forces created by Provost Reif will generate innovative suggestions as to how MIT can continue to compete with the top ranking research universities in the world. My concern is not regarding MIT's competitive strength: knowing the sheer intellectual power of the MIT faculty, I am confident that no matter what happens to MIT's endowment income, the Institute will remain a leader in Science and Engineering; and even the other three Schools – SHASS, Sloan, and SA+P – are likely to retain their outstanding reputations. MIT will continue to be a place for inventions as well as innovations, as long as we do not lower the high standard of scholarly endeavors for which MIT long has been known.

Yet, as MIT faculty, should we ask more of ourselves, at a time when economic gloom and political hopefulness have created a unique moment for reflection? What is expected of us as faculty, not by the MIT administration, but by people in the U.S. as well as abroad who look up to MIT as a meritocratic learning institution solely engaged in pursuing knowledge, not constrained by either social stratification, religious preferences, or business instincts. Do you remember how the world applauded MIT's creation of OpenCourseWare (OCW)? It was hailed as a bold statement by MIT, upholding the noble principle that human knowledge should be accessible to all who care to learn.

In the past, until the student protests of the 1960s brought the issue into question,

universities in general were respected as institutions that symbolized such moral principles. But, more recently, as many universities have tried to mimic the worst practices of private firms by competing for top rankings in magazines such as *U.S. News and World Report*, there has been growing doubts about the social role of universities and whether they really deserve the tax-exempt status they enjoy. Perhaps because of MIT's long established reputation as a meritocratic institution without any fancy frills that has generated path-breaking innovations in science and technology for the benefit of humankind, the Institute has not been tarnished as yet by such criticism in the popular press. MIT's policies on OCW solidified this reputation, offering people in the U.S. as well as around the world the ability to believe that there could be social institutions they can respect, admire, and cherish for upholding moral principles against market trends and governmental pressure.

The moment has arrived, it seems to me, for MIT faculty to appreciate this expectation and consider what would be the appropriate action the faculty should take as the nation and the world grapple with not only a major economic crisis, but also a crisis of confidence in social institutions, many of which are unable to uphold moral principles in the face of economic pressures. Two thoughts come to mind: One regards the practice of tenure, which was intended to defend academic freedom, a goal which is more important now than ever before; because freedom of thought is essential for social questioning of established knowledge and practices. There is a second element that also influences the vitality of academic life – namely: non-mandatory retirement, whose continuing relevance and moral underpinnings can easily come into question. Is it not appropriate that we reconsider the value of non-mandatory retirement as employment opportunities for young academics shrink, and the need for intellectual renewal becomes steadily more urgent as established paradigms of knowledge begin to stagnate?

I realize that this is not a question with an easy answer, but it is a question that must be asked and should be deliberated upon by our faculty. And, as we deliberate, we must acknowledge that the current

If as academics we understand the social need for tenure to protect freedom of research, and also agree that intellectual renewal is absolutely essential for intellectual vibrancy and progress of ideas, why can't we voluntarily decide that 30-35 years of full-time employment as an academic offers us a reasonable amount of time

economic crisis has seriously affected the retirement incomes of faculty; and that faculty who have been appointed with a set of contractual agreements may not be willing to reconsider such contracts even midway in their career. The MIT administration can, of course, continue to encourage faculty to retire after a significant period of employment – say, 30 to 35 years – and such incentive policies may be sufficient to induce some faculty to retire, as the evidence from this year's (2009) retirement records indicate. I am not arguing against such incentive policies. What I am asking is: Can we as the faculty of one of the leading research universities in the world begin to think beyond personal considerations of economic benefits and generate a moral conversation about the social responsibilities for university faculty? Can we not set a national example of what we autonomously consider are the essential elements of a life of the mind, without being pressured either by impending legislation or market fluctuations?

Should we not start the discussion as the nation enters a new phase of contrasting economic gloom and political hopefulness? If as academics we understand the social need for tenure to protect freedom of research, and also agree that intellectual renewal is absolutely essential for intellectual vibrancy and progress of ideas, why can't we voluntarily decide that 30-35 years of full-time employment as an academic offers us a reasonable amount of time, before that same opportunity and honor is offered to other, younger colleagues?

It is not unusual to hear arguments against policy reform, especially from within a community that would experience the reform firsthand. I am aware of some of the arguments against my sugges-

tions: that universities may not replace all retiring faculty, thereby burdening the young faculty; that initiating mandatory retirement based on fixed years of employment may have a varied impact on scholars from different disciplines; that if only universities could be more generous with retirement incentives, faculty would retire voluntarily; that the current economic crisis makes it impossible for faculty to consider retirement amidst such economic uncertainties; and, finally, that once the faculty agrees to amend the rules regarding retirement, next the tenure system will be under attack.

But the MIT faculty is not just any community, or a mere "stakeholder" who sees nothing but his/her self-interest. It is my hope that the MIT faculty will choose hopefulness over fear, celebrate collective idealism over narrow self-interest, and thereby lead the world in reaffirming that universities as social institutions still uphold moral principles, autonomously, without either the coercive power of government or pressure from market forces.

And, after all, retirement is not the end of our life of the mind: As I read, periodically, Professor Emeritus Robert Solow's beautifully written pieces in *The New York Review of Books* on various economic issues, I am awed by the immense potential for social and intellectual contribution one can make long after one's retirement. ■

Bish Sanyal is a Professor of Urban Planning and Faculty Chair (sanyal@mit.edu).

MIT Faculty Vote to Make Their Articles Openly Available

Hal Abelson
Ann Wolpert

ON MARCH 18, 2009, MIT faculty at the Institute faculty meeting voted unanimously to make their scholarly articles openly available, the first university-wide faculty vote of its kind anywhere. The vote represented the culmination of a broadly deliberative process that began in June of 2008, when Bish Sanyal, Chair of the Faculty, charged a committee of faculty to explore how scholarly publications and research findings of MIT faculty can be best disseminated at a time of significant changes in communication technologies.

Over the course of many months the committee consulted widely with their faculty colleagues, considering both the structure and practices of the scholarly publishing industry, and the way scholarly research across a full range of disciplines is produced, contested, and disseminated. MIT has long been a leader in projects and initiatives that encourage the open sharing of knowledge, with the goal of advancing learning and education world-wide.

MIT's policy is the first faculty-driven, university-wide initiative of its kind in the United States. The new policy, which took immediate effect, emphasizes the commitment of MIT faculty to disseminating the fruits of their research and scholarship as widely as possible. This is important, because Committee members [Ad Hoc Faculty Committee on Open-Access Publishing] heard repeatedly from their colleagues that publisher business models, which are built on restricted access, impede reuse and sharing of the scholarly record – in contradiction to MIT's mission of rapid dissemination of science and scholarship.

In its considerations, the Committee drew upon the successful precedent of MIT

research openly available to the world using MIT's DSpace repository – an

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OpenCourseWare (OCW), which was launched in 2001 with the goal of making all MIT course materials available, free of charge, to anyone, over the World Wide Web. Since then, OCW has shared MIT course materials with more than 50 million

open-source, open-access repository launched in 2002 following a joint research project between the MIT Libraries and Hewlett-Packard. DSpace@MIT already contains digital research materials of MIT faculty and researchers, allowing such works to be saved, searched, and shared worldwide.

A key finding of the Committee's investigations is that scholarly publishing has so far been based purely on contracts between publishers and individual faculty authors. In that system, faculty members and their institutions are powerless. This resolution changes that unequal relationship by creating a role in the publishing process for the faculty as a whole, not just as isolated individuals.

The implementation of the MIT Faculty Open Access Policy is being overseen by the Faculty Committee on the Library System, and will evolve over the coming months. The policy applies only to scholarly articles completed after the policy was adopted on March 18, 2009. Procedures for submission to DSpace under this policy are still under development. For now, please contact Ellen Duranceau (efinnie@mit.edu) if you have a paper you want to submit.

Members of the Ad Hoc Faculty Committee on Open Access

Hal Abelson, Chair (EECS)
Ann J. Wolpert, Co-Chair (Director of Libraries)
Craig Carter (Materials Science)
Brian Evans (EAPS)
Kai von Fintel (Linguistics & Philosophy)
Eric Klopfer (DUSP)
Pauline Maier (History)
Oaz Nir (Graduate Student Council President)
Robert T. Sauer (Biology)
Lisa A. Steiner (Biology)
George N. Stiny (Architecture)
Eric von Hippel (Management)
JoAnne Yates (Management)

visitors worldwide and inspired hundreds of other universities to do the same.

The new open-access resolution will remove barriers to making all of MIT's

A detailed FAQ is available to faculty at web.mit.edu/libraries/www/about/scholarly/restricted/faq.html.

The full text of the policy is as follows:

MIT Faculty Open-Access Policy

The Faculty of the Massachusetts Institute of Technology is committed to disseminating the fruits of its research and scholarship as widely as possible. In keeping with that commitment, the Faculty adopts the following policy: Each Faculty member grants to the Massachusetts Institute of Technology nonexclusive permission to make available his or her scholarly articles and to exercise the copyright in those articles for the purpose of open dissemination. In legal terms, each Faculty member grants to MIT a nonexclusive, irrevocable, paid-up, worldwide license to exercise any and all rights under copyright relating to each of his or her scholarly articles, in any medium, provided that the

articles are not sold for a profit, and to authorize others to do the same. The policy will apply to all scholarly articles written while the person is a member of the Faculty except for any articles completed before the adoption of this policy and any articles for which the Faculty member entered into an incompatible licensing or assignment agreement before the adoption of this policy. The Provost or Provost's designate will waive application of the policy for a particular article upon written notification by the author, who informs MIT of the reason.

To assist the Institute in distributing the scholarly articles, as of the date of publication, each Faculty member will make available an electronic copy of his or her final version of the article at no charge to a designated representative of the Provost's Office in appropriate formats (such as PDF) specified by the Provost's Office.

The Provost's Office will make the scholarly article available to the public in an

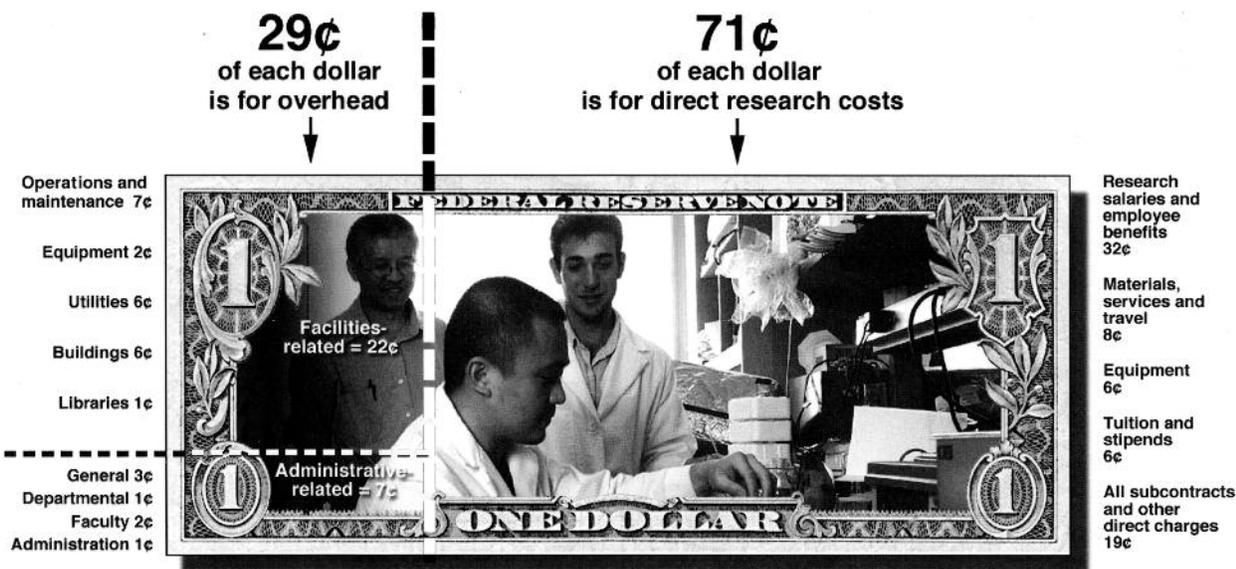
open-access repository. The Office of the Provost, in consultation with the Faculty Committee on the Library System, will be responsible for interpreting this policy, resolving disputes concerning its interpretation and application, and recommending changes to the Faculty. The policy is to take effect immediately; it will be reviewed after five years by the Faculty Policy Committee, with a report presented to the Faculty.

The faculty calls upon the Faculty Committee on the Library System to develop and monitor a plan for a service or mechanism that would render compliance with the policy as convenient for the faculty as possible. ■

Hal Abelson is a Professor in the Department of Electrical Engineering and Computer Science and Chair of the Ad Hoc Faculty Committee on Open Access Publishing (hal@mit.edu); **Ann Wolpert** is Director of Libraries and Co-Chair of the Ad Hoc Faculty Committee on Open Access Publishing (awolpert@mit.edu).

M.I.T. Numbers

The Federal Research Dollar on the MIT Campus



Source: MIT Office of Sponsored Programs, FY08
 Chart: MIT, October 2008

Image: Andy Wijaya, an MIT graduate student in chemical engineering, prepares a gold nanorod solution for pump-probe spectroscopy with (standing, left to right) postdoc Aaron Schmidt and professor Gang Chen observing. MIT researchers are working on ways to modify these gold nanorods so they could be used as drug delivery or anti-tumor devices.

Rethinking the Math Core

Sipser, from page 1

their variants. Additionally, we are rethinking 18.03 Differential Equations, 18.05 Probability and Statistics, and 18.06 Linear Algebra. This article serves to “get the word out” about this curriculum review. We welcome your input to: mathcore@mit.edu.

Here’s the situation now in the freshman math subjects. Calculus I (18.01) covers single-variable calculus: differentiation, integration, applications to simple modeling, with very brief introductions to low-order Taylor approximations, some infinite integrals and their related series, and polar coordinates. Calculus II (18.02) is multivariable calculus: a brief introduction to vectors and matrices, then partial differentiation and multiple integration, gradient, divergence and curl, line and surface integrals, the divergence and Stokes theorems. Both of these subjects are taught in lecture/recitation format. One faculty member lectures for the entire semester, three times a week for an hour. A mix of mainly post-doctoral instructors and TAs handles the twice-weekly recitations.

We offer two additional placement options into the 18.01 – 18.02 sequence for students with sufficient preparation. About half the freshmen place out of 18.01 entirely and enter immediately into 18.02. Or, freshmen may partially place out of 18.01 by demonstrating that they have mastered the high school calculus AB syllabus – roughly half of the 18.01 material. With this head start they may take 18.01A – 18.02A which covers the remainder of 18.01 in six weeks and then continues with 18.02. This shortened sequence occupies the fall term and may be finished either over IAP or during the first half of the spring term, for a total of 1.5 semesters of instruction. Thus we provide three entry points into calculus to accommodate differing backgrounds.

In addition, we offer several alternate calculus “flavors” for students desiring a different point of view. Instead of 18.02,

students may elect 18.022 to experience a more theoretical emphasis, or 18.023 to see more applications. Finally, instead of 18.01 – 18.02, mathophiles with some prior calculus background may choose the 18.014 – 18.024 sequence to get a proof-oriented, rigorous development of the subject.

cific ways. Currently, students receive course credit for advanced placement, which allows them to use the freed-up time to take some other subject or simply to have more free time in their schedule. Proposal: We could change the math GIR to encompass only the 1.5 semesters of 18.01A – 18.02A plus one half-semester of

Calculus Options	
18.01 – 18.02	2 terms, basic sequence
18.01A – 18.02A	1.5 terms, skips half of 18.01
18.02 Fall	1 term, skips 18.01
18.022 Fall	1 term, extra theory, skips 18.01
18.023 Fall	1 term, extra applications, skips 18.01
18.014 – 18.024	2 terms, rigorous

What might we accomplish with a revision of the curriculum? We’ve come up with several ways we might improve our current program. The ideas here are not necessarily optimal, and are certainly not intended to be an exhaustive list. We offer them mainly to get the conversation started.

something else, for example a shortened introduction to probability and statistics. A serious problem with this proposal is that the 200 or so freshmen who now take the full basic sequence would be at a disadvantage because they would need to complete the missing AB-syllabus half of 18.01 before they could start their math

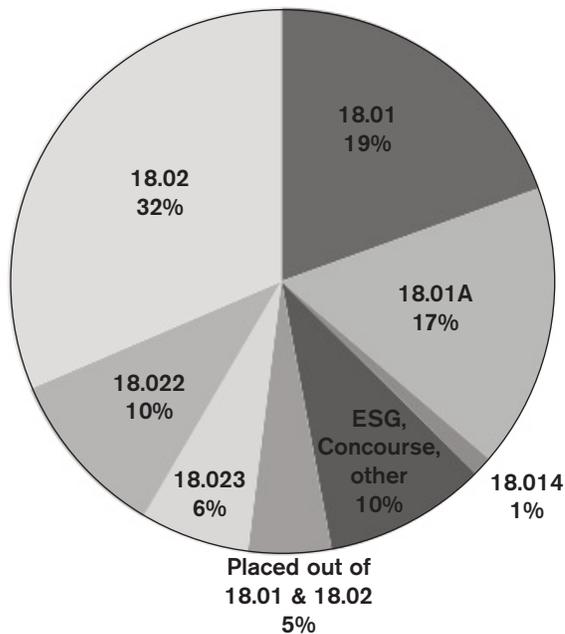
The absence of probability and statistics is a major gap in the present structure of the GIRs. Some knowledge of probability is simply indispensable these days in many disciplines and careers. An MIT education should provide that knowledge.

As the accompanying pie chart shows (next page) only about 19% of the freshman class selects the basic 18.01 – 18.02 sequence; the rest place out of 18.01 to varying degrees. Thus for most of our undergraduates, the *de facto* calculus course requirement ends up being less than two full subjects taken at MIT, because most students already know some calculus before they arrive here. Twenty years ago, over half of our entering students took 18.01. Today, calculus has moved into the high-school curriculum for many of our students. That shift frees up some of their time at MIT.

GIR. We could require all entering students to know enough calculus to begin with 18.01A, and ask them to take a preparatory summer class prior to entering if they don’t have this background, but that would place a big – probably too big – burden on certain students, and add significant complexity to the transition into MIT.

The absence of probability and statistics is a major gap in the present structure of the GIRs. Some knowledge of probability is simply indispensable these days in many disciplines and careers. An MIT education should provide that knowledge. Our post-graduation surveys of mathematics majors consistently show that our

Fall 2008 Enrollment Percentages



own graduates wish they had learned more probability and statistics. We could introduce this material into the GIRs as mentioned above. Alternatively we could substitute probability for some other material in the basic calculus sequence. The second half of 18.02 is devoted to vector integral calculus culminating in the divergence and Stokes theorems. Though that material fits naturally with multi-variable calculus and is useful in subjects like electricity and magnetism, thermodynamics, and fluid mechanics, the need for it may have diminished in recent years and therefore a more abbreviated treatment may be adequate. We've experimented with a few lectures on probability in 18.02 and 18.01A. Whether more probability and statistics can be added sensibly to 18.02 in place of some vector calculus requires further study.

Less radical adjustments in the curriculum are also under consideration. We have engaged with other departments to solicit suggestions about new topics and applications for inclusion in calculus and differential equations lectures and problem sets. We encourage faculty from

across the Institute to become involved in crafting the basic mathematics curricu-

We have engaged with other departments to solicit suggestions about new topics and applications for inclusion in calculus and differential equations lectures and problem sets. We encourage faculty from across the Institute to become involved in crafting the basic mathematics curriculum so that we can best serve our students by enhancing the breadth and relevance of these subjects.

lum so that we can best serve our students by enhancing the breadth and relevance of these subjects. In addition to suggestions as to content and problem material, we'd welcome an occasional guest lecture on an interesting application (preferably reinforced with a problem contributed to that week's pset!), or possibly some form of lecture or recitation co-teaching if there were interest and it seemed workable.

Several tempting ideas for improving our core math curriculum look less attractive upon deeper scrutiny.

Modifying 18.01 might be an appealing way to address certain problems, but the existing 18.01 curriculum is tightly coupled to the standard high school advanced placement courses and exams. Tampering significantly with 18.01 would break that correspondence and the existing advanced placement system would no longer apply.

A few possibilities are on the table for revising the introductory non-GIR mathematics subjects. Our 18.05 Introduction to Probability and Statistics can always profit from new connections to statistical problems in fields like biology and finance. Revised curricula in Engineering could have an impact on the syllabus of 18.03 Differential Equations. Communication with other departments is a vital activity in keeping these courses current and useful to our students.

We have enlisted the help of the Teaching and Learning Laboratory in our curriculum review process. A d'Arbeloff

grant is providing much-appreciated support. Our timeline involves gathering input throughout the rest of this semester and into the fall term 2009, overlapping with course redesign beginning this summer and running through calendar year 2010.

Please send us your comments to: mathcore@mit.edu. ■

Michael Sipser is a Professor of Applied Mathematics and Head, Department of Mathematics (sipser@mit.edu).

Teach Talk

TA Training Bootcamp Reinforces Curriculum Innovations and Improves Recitation Experience in Freshman Chemistry

Elizabeth Vogel Taylor
Rudolph Mitchell
Catherine Drennan

THROUGH A GRADUATE-STUDENT teaching-assistant (TA) training “bootcamp,” a modest time investment by Chemistry teaching staff prior to the semester is resulting in 5.111 TAs with outstanding teaching skills, confidence, enthusiasm, and effectiveness throughout the term. In considering innovations recently incorporated into the 5.111 freshman chemistry curriculum that highlight the underlying chemical principles in examples from biology and medicine, we realized that any work to improve the 200-plus-student course must be reinforced by improved TA training.

Our goals in creating a bootcamp for the 10 TAs assigned yearly to this course included improving teaching in the TA-led recitation sections by increasing the TAs’ confidence in and enthusiasm for the material and for teaching, and by creating a community of support and collaboration among the TAs. While our program was designed for a chemistry course, the bootcamp structure and activities are relevant for any subject with TA-led recitations.

Bootcamp Design and Components

The bootcamp consists of five part-day sessions (~ 20 hours total) throughout the week prior to the start of classes. An initial concern in designing a bootcamp was the limited time that most professors have available to devote to TA training. To reduce faculty time requirements, the schedule is organized to split the activities among course instructors, former TAs, and others involved in the course or department. While significant time was spent designing the program, the time commitment of executing the bootcamp

is modest. Program activities address teambuilding, teaching skills, and exposure to the course material and philosophies, while generating excitement for the course content and for teaching. A sample

The bootcamp consists of five part-day sessions (~ 20 hours total) throughout the week prior to the start of classes. . . . To reduce faculty time requirements, the schedule is organized to split the activities among course instructors, former TAs, and others involved in the course or department.

schedule is shown in the table (next page), with a more detailed version available on the MIT 5.111 OpenCourseWare Website: ocw.mit.edu/OcwWeb/Chemistry/5-111Fall-2008/CourseHome/index.htm.

Teambuilding. A supportive group dynamic can reinforce the dedication and excitement of individual TAs and provide an environment where TAs build off of each other’s strengths. Bootcamp begins with a discussion-based teambuilding exercise in which each TA and faculty member answers questions such as *What was your first college chemistry course like?* and progresses, as the comfort level of the group increases, to *What is your biggest fear or concern about teaching MIT undergraduates?* In addition to specific teambuilding exercises, teamwork and community building is stressed throughout bootcamp as the graduate students participate in all activities together.

Teaching skills. Strengthening teaching skills is addressed through an active learning workshop, utilizing the book *Scientific*

Teaching by J. Handelsman et al., through a workshop on diversity in the classroom, where TAs discuss “A barrier of mistrust: how negative stereotypes affect cross-race mentoring,” an excellent chapter from

Improving Academic Achievement, and through a microteaching experience in which each TA presents a 10-minute problem-set example to the group. Microteaching is a successful training activity that has been used for many years in the MIT Chemistry Department and throughout the Institute with first time TAs. Typically, each TA is taped teaching a selected problem, and receives immediate feedback from the group in addition to an opportunity to view the tape themselves. (Video equipment is available through MIT Audio Visual Services at studentlife.mit.edu/dsl/es/av.) We expanded on this model by introducing a practice session prior to the taping, which enables the TAs to adjust their teaching based on initial critiques from the group.

Common challenges in leading recitations and working with MIT freshmen are explored through two bootcamp sessions (3 hours total) led by former course TAs. 5.111 students have diverse backgrounds, including some students with weak high school chemistry preparation, and many of the freshmen struggle to

Sample Bootcamp Schedule

Day 1 (5 hours)

- Welcome and introduction to 5.111 (1 hour) (F)
Introduction of the 5.111 faculty. Discussion of course and TA training goals and resources.
- Discussion-based teambuilding exercises (1 hour) (F)
- Chemical principles in biology and medicine (1 hour) (I)
Presentation of representative biological examples that will be introduced during 5.111 lectures.
- Activity-based teambuilding (2 hours) (I)

Day 2 (5.5 hours)

- Recitation challenges: Discussion and role playing with former 5.111 TAs – Part I (1.5 hours) (T)
- Q/A on summer practice problems and selection of microteaching problems (1 hour) (I).
- Tour of the 5.111 classroom, chemical education office, and recitation rooms (30 min) (I)
- Diversity workshop (1 hour) (F, I, T, or guest speaker)
- Strategies for teaching difficult problems, such as acid-base titration problems (1.5 hours) (F)

Day 3 (3 hours)

- Microteaching Practice Session (3 hours) (F)(T)

Day 4 (4 hours)

- Recitation time selection and Q/A on TA graduate course selection (1 hour) (I)
- Classroom clicker demonstration and overview of 5.111 clicker policies and competitions (1 hour) (I)
- Active learning workshop (1.5 hours) (I)
- Recitation challenges: Discussion and role playing with former 5.111 TAs – Part 2 (1.5 hours) (T)

Day 5 (4 hours)

- Microteaching taping (3 hours) (T)
- Wrap-up and assessment (1 hour) (I)

Activities labeled with (F) are lead by faculty, (I) are lead by an instructor or head TA, and (T) are lead by former 5.111 TAs. (Faculty participation is beneficial in any of the activities, but only necessary for those indicated.)

adjust to the workload at MIT. Bootcamp provides an opportunity to prepare the TAs for the unique blend of academic and emotional support required to help freshmen thrive both in 5.111 and as MIT students. Each of eight former TAs leads a discussion and role-playing scenario on topics such as dealing with disruptive students, helping freshmen manage their time, responding to suspected cheating, helping failing students get on track, encouraging class participation, reaching out to students with weak high school backgrounds, and balancing TA responsibilities with lab obligations and coursework.

Exposure to Course Material and Philosophies. Incoming Chemistry graduate students begin teaching at the start of their first semester. Some of these new graduate students express anxiety over teaching material with which they are not completely confident, and worry that the undergraduates will ask questions they can't answer. In addition, it was observed in previous years that certain challenging topics (namely acid-base titration problems) were poorly understood by some TAs, and that students in those TAs' recitations were less successful on related test problems. To provide TAs extra time to digest the relatively dense material in

general chemistry, for which MIT combines two semesters' worth of material into a single semester, practice exams are mailed to the TAs to complete over the summer. During bootcamp, a block of time is devoted to reviewing the most difficult concepts, including how best to approach and teach those types of problems.

Course innovations and technology are also discussed during bootcamp. For example, the TAs are given a presentation that introduces many of the cross-disciplinary examples used during the semester, a new element of the course. Bootcamp also includes a demo on classroom response devices, or clickers, that are used in 5.111 lectures (chemistry and physics both use RF clickers from Turning Technologies, www.turningtechnologies.com).

Bootcamp Assessment

A detailed assessment of the bootcamp and its impact on the TAs and undergraduate students was carried out by the Teaching and Learning Laboratory at MIT (web.mit.edu/tll). The primary assessment subjects were the 20 TAs who participated in the 2007 and 2008 bootcamps and the more than 350 undergraduates enrolled in the course who provided the student perspective on the recitation experience. Due to the small TA sample size, multiple methodologies were employed to provide credible and stable findings. Methodologies included TA surveys, two TA interviews (post-bootcamp and post-course), and a student survey for each year of the program.

The post-course student survey probed how the 5.111 students viewed their TAs and recitation experiences. Mean scores on a seven-point rating scale are shown in the table on the next page. As a comparison point to calibrate the 5.111 student ratings, the mean overall course rating for 5.111 in the five years previous to the TA training program, 2002 to 2006, was 5.4 for the fall and 3.7 for the spring semesters. The 2007 and 2008 TA recitation performance ratings, with an overall mean of > 6 across all items, were extremely high, confirming that the TAs

continued on next page

TA Training Bootcamp

Taylor, et al. from preceding page

connected with students through support, enthusiasm, and preparedness. Responses further indicate that the TAs led successful recitations in which students were com-

success of bootcamp, team-building activities, discussions with former TAs, and microteachings stood out most.

Correlating with the positive responses in the TA assessment, the number of applicants to the 5.111 bootcamp program indicates that many research stu-

tion complaints, leaving more time for positive interactions with the students, such as discussing research and career opportunities in chemistry. To quote Drennan, "Hours spent in TA training paid off three-fold in hours saved dealing with problems during the semester.

TA Recitation Performance: Means and Standard Deviations (SD) of 5.111 Students' Responses* to Recitations Questions of the 5.111 Student Learning Experience Survey

TA Recitation Performance Scale & Items	2007			2008		
	Mean	SD	N	Mean	SD	N
TA Recitation Performance Scale.**	6.1	1.1	185	6.0	1.0	165
My TA wanted us to do well.	6.6	.80	190	6.5	.74	168
My TA was enthusiastic about chemistry.	6.5	.79	191	6.2	1.1	168
My TA was well prepared.	6.2	1.1	191	6.2	1.1	168
My TA explained the material well.	6.0	1.4	187	6.0	1.3	168
My TA was helpful.	6.1	1.3	191	6.2	1.1	168
I found recitation an effective learning experience.	5.7	1.6	191	5.7	1.6	168
I felt comfortable asking questions.	6.1	1.2	191	5.9	1.3	168
I found recitation useful.	5.8	1.5	191	5.8	1.6	168
The recitation made me think.	5.6	1.6	191	5.5	1.7	168
My TA discussed the lecture concepts.	6.1	1.1	191	6.2	1.0	168
My TA explained solutions to the problems well.	6.0	1.4	190	6.1	1.3	167
Recitation complemented lecture concepts and attitudes.	5.9	1.3	191	6.0	1.3	166

*Students use a seven-point rating scale to indicate how well they agree with each statement: "1" = "strongly disagree," "4" = "neutral," "7" = "strongly agree." **Coefficient alpha for the TA recitation scale = .96.

fortable asking questions, and felt the TAs explained solutions well and were enthusiastic about the material.

The TAs attributed the positive recitation experiences in large part to their training. Through the surveys and interviews, the TAs expressed tremendous support and enthusiasm for bootcamp. They reported that the experience was positive, effective, and relevant, and they believed that bootcamp allowed them to gain confidence in teaching, develop teaching skills, and evolve into a team. Their increased confidence made them less afraid of teaching and more willing to engage students in ways they would not have considered prior to bootcamp. By participating in bootcamp, the TAs strongly believed they were better prepared than TAs for other courses. Although the TAs identified a number of positive factors that contributed to the

students are actively interested in gaining teaching skills. For the fall of 2007, 25% of incoming MIT Chemistry graduate students applied for the 5.111 TA positions, and that number rose to 39% in 2008. Several TAs identified the TA training opportunity in 5.111 as an important factor in their decision to come to MIT.

From the instructor perspective, the time investment in TA training resulted in less time spent troubleshooting TA and student problems throughout the term, which may be at least partly attributed to TAs who were equipped with a better understanding of student resources, teaching strategies, and course material. For example, in comparison to the seven years that Prof. Drennan taught 5.111 without bootcamp, in the two years with bootcamp she observed a drastic reduction in students asking fundamental problem solving questions or approaching her with recita-

Investing one fun hour to replace every three stressful ones is an easy decision."

While we feel that the small group size of the training led to significant benefits in creating supportive and closely-knit teaching teams, many of the activities are amenable to larger groups of TAs. In fact, several workshops planned for the 5.111 TAs were incorporated into department-wide TA training. By offering a TA training program, departments may attract more top graduate applicants to their research program, all while strengthening teaching within the department, and providing a valuable training experience for the TAs. ■

Elizabeth Vogel Taylor is an HHMI Instructor in the Chemistry Department (evogel@mit.edu); **Rudolph Mitchell** is the Associate Director for Assessment and Evaluation for the Teaching and Learning Laboratory (rudy@mit.edu); **Catherine Drennan** is a Professor of Chemistry and Biology and an HHMI Professor and Investigator (cdrennan@mit.edu).

MIT Faculty Work/Life Website Created

NO DOUBT THERE IS a lot of information “out there” to support MIT faculty in the area of work/life balance. The problem has been accessing this information – since it is located on so many different MIT Websites. Problem solved. Thanks to a generous donation from an alumnus and designation by Institute Professor Daniel I.C. Wang, the Center for Work, Family and Personal Life has created the MIT Faculty Work/Life Website to pull together these types of resources: web.mit.edu/facultyworklife.

The new site is a clearinghouse targeted to faculty, those who work with faculty, and all members of the MIT community seeking information on such matters as health and wellbeing, life

outside of MIT, housing and commuting, and retirement and financial planning, *specifically* for faculty. It is a complement to the Faculty Resources Website maintained by the Provost’s Office, which focuses on supporting the professional needs of faculty: web.mit.edu/faculty.

One of the unique features of the site is “Finding Community,” which includes a “Living in Boston” section, with links for black and African American faculty and their families; Hispanic and Latino faculty and their families; Asian and South Asian faculty and their families; and American Indian faculty and their families. It also highlights resources for lesbian, bisexual, gay, and transgender faculty and their families as well as resources for faculty with

disabilities and their families. In addition, there are networking and mentoring links.

Along with providing a gateway to these resources, another goal of the new Website is to increase both internal and external awareness of the many facets of work/life. It is hoped the site can also serve as a recruiting tool, as it demonstrates that all are welcome at MIT, while promoting the value of balancing work and life for MIT faculty. The benefits of doing so are clear, as noted by President Hockfield, quoted on the site’s homepage: “Helping faculty members find a comfortable work/life balance fuels their creativity, fosters their extraordinary teaching and research, and strengthens the MIT community.” ■

MISTI Launches Call for Second Round of Global Seed Funds Proposals

MIT INTERNATIONAL SCIENCE and Technology Initiatives (MISTI) has launched a call for proposals for its second round of Global Seed Funds grants. The program provides funds to MIT faculty and researchers to support early-stage international projects and research collaboration. Applicants are encouraged to involve MIT students – both undergraduate and graduate – in their projects.

MISTI Global Seed Funds includes a general fund for projects anywhere in the world and six country funds. The award may be used to cover travel, meeting and workshop costs to facilitate international projects and collaboration. The deadline for applications is September 14, 2009.

Of the 104 proposals received in the inaugural grant round, 27 projects were awarded \$457,000 in funding. Faculty and research scientists from 26 departments submitted proposals for projects in 42 countries.

The MISTI Global Seed Funds program was initiated through funding from the Office of the Provost to enhance the internationalization of MIT research and education.

“By enabling MIT students to participate in faculty-led international projects, we hope to increase opportunities for hands-on, global learning and connection to innovation around the world,” said Richard Samuels, director of the Center

for International Studies.

MIT’s largest international program, MISTI is a pioneer in applied international studies. Since 1994, the program has placed over 3,000 MIT students in professional internships and research positions with its network of leading companies, universities, research institutes, and NGOs around the world. MISTI currently operates in nine countries: China, France, Germany, India, Israel, Italy, Japan, Mexico, and Spain. The program is a part of the Center for International Studies.

For more details and to apply, visit: mit.edu/misti/faculty. ■

Arts & Humanities at MIT

Helen Elaine Lee

WITH THIS ISSUE OF the *Faculty Newsletter* we initiate another regular feature: Arts & Humanities at MIT.

Some faculty in these disciplines feel that they live on the margin of the Institute, and many other MIT faculty members have no idea what goes on in this realm of academic life. They have only a vague notion that the School of Humanities and Social Sciences somehow serves the rest of the Institute and facilitates its missions in the areas of science and engineering and economics.

But all over our campus people are writing poems and novels and plays, composing music and dance, examining and criticizing culture, investigating language and literature, considering and shaping

the ever-shifting forces of narrative and media. Faculty members, students, and staff are raising their voices in myriad ways about what matters in our lives and our society. And these efforts enrich our community in untold ways. Indeed, they give it life.

As poet and Nobel laureate Pablo Neruda said, poetry is revolutionary, as it asks: Imagine the world like this.

Imagining is what we do at MIT. It is the work of the scientist and the engineer to imagine, discover, and invent. And it is also the essential work of the artist and humanist to help us to imagine ourselves, our institutions, and our environments differently and to bring these efforts to bear on the work of the scientist and engineer.

Through this new feature, we hope to shed light on what kinds of imaginings are going on in the arts and humanities at MIT, what people are thinking about and grappling with in these areas, and how these unique contributions enrich the other disciplines.

In each issue we hope to include articles on work being done in the arts and humanities by our faculty members, articles on the roles of these disciplines and their relationship with the rest of the Institute, as well as literary and visual artwork created by members of the MIT community.

Please submit your articles and work (fnl@mit.edu) so that the entire faculty can see and recognize what a vital role the arts and humanities play at MIT. ■

LAUGHING TOGETHER

(A term reportedly used by some Native peoples of the Americas for lovemaking)

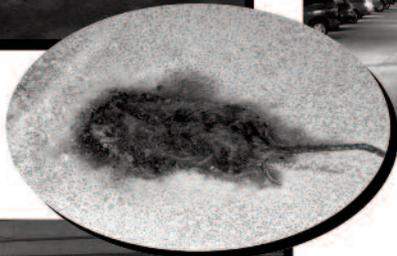
So this is how it's done,
this laughing together
that anneals, that heals and works
a miracle—no, a hundred miracles,
and makes such heat, burning
through the husk of habit
and of time, some dream
recalled, not in repose
but in the light
of a thousand suns.

And what can bloom
in such a landscape?
Everything:
the glint of your teeth
in the close and friendly dark,
the warm spice of your breath,
your skin, your eyes, your hands,
my eyes and hands opening,
mouth arms legs opening
wide in the body's warmest smile.

Laughing, and together,
we are reaching,
blind, to find
the lines and limits
of the love
this laughing makes.

Rebecca Blevins Faery

West Garage



David Lewis

Bernard M. Gordon-MIT Leadership Program: Developing Engineering Leaders of Tomorrow

Edward F. Crawley

IN ITS RECENT REPORT, *The Engineer of 2020: Visions of Engineering in the New Century*, the National Academy of Engineering outlined the various fields in which students educated in engineering might go on to be leaders, including research, product and system development, business, and even broader professions. The NAE concludes that:

“In preparation for this opportunity, engineers must understand the principles of leadership and be able to practice them in growing proportions as their careers advance. Complementary to the necessity for strong leadership ability is the need to also possess a working framework upon which high ethical standards and a strong sense of professionalism can be developed.”

MIT has a responsibility to its students to prepare them for the roles they will play in life. Our existing academic engineering programs provide a firm basis of disciplinary knowledge and the modes of thought critical to the particular field – principally problem solving and research for engineers – and courses in the humanities and social sciences provide other disciplines with new ways of thinking and experiencing the world.

However, we could do a better job of preparing our students in the broader array of personal and professional capabilities from which they will draw in life, including critical and creative thinking, relating to others as members and leaders of teams, making sense of complex contexts, and creating visions of the future.

As faculty, we’re challenged constantly to mold our students into better thinkers and better communicators. These invaluable characteristics are applicable in all facets of our students’ lives. They will make a future researcher more effective and they will make a future product/system developer more competitive. Beyond engineering, these characteristics are applicable to other roles that our graduates may play in life, including as leaders of society and even members of a family. The challenge, of course, is how we could do more to meet these needs of the students within the time resources of an undergraduate program.

The Bernard M. Gordon-MIT Engineering Leadership Program (Gordon ELP) has been established to develop our engineering undergraduates into leaders in their fields. The Program, launched in August 2007 through a \$20 million gift by the Gordon Foundation – the largest gift ever made to MIT’s School of Engineering for curriculum development – is co-directed by Joel Schindall, Professor of the Practice in EECS, and myself. Bernard M. Gordon, one of our most distinguished alumni, is the inventor of the analog-to-digital converter, and our first alumnus to win the National Medal of Technology.

The Gordon ELP helps to develop these key personal and professional capabilities by exposing MIT undergraduate engineering students to challenging appropriate conceptual frameworks and models and by repeatedly engaging them in hands-on authentic experiences.

Because it is designed as a program for engineering students, the Gordon ELP contextualizes these traits in the areas where engineers are most likely to benefit, in the professional practice of engineering – the creative innovation, including the design and implementation of new products, processes, projects, materials, molecules, software, and systems, supported by the invention of enabling technologies, that together meet the needs of customers and society.

We also hope to influence other universities and the nation. By educating and developing the character of outstanding MIT students as potential future leaders in the world of engineering practice and development, and endeavoring to transform engineering leadership in the nation, the Gordon ELP seeks to increase and improve significantly our nation’s product development capability, making it a more industrially competitive place in the future.

The program was shaped over the academic year 2007-2008 through extensive benchmarking and consultation within and outside the MIT community. Especially valuable were the inputs and cooperation of others at MIT who help to prepare leaders: the Sloan Leadership Center, the student leadership programs under the Dean for Student Life, the ROTC programs under the Dean for Undergraduate Education, and the diverse design programs in the School of Engineering.

What emerged was a distributed program with two main themes:

- The first theme seeks to strengthen the program for all undergraduates in engineering by providing resources and modules to departments in teamwork, project management and project-based learning. These resources are highlighted below.
- The second theme develops a curricular and co-curricular program consisting of the UPOP program for sophomores, a series of 6 to 9 unit subjects for juniors and seniors, and a weekly reflective Engineering Leadership Lab. Some of these offerings are existing subjects, and some are in development this academic year with a pilot group of 21 juniors and seniors.

One of our collaborators, Tom Kochan, George M. Bunker Professor of Management at MIT's Sloan School of Management, observed recently: "To me, the Gordon-MIT Engineering Leadership Program rediscovers MIT's culture of *Mens et Manus*. It builds on the momentum of many fine departmental educational efforts and represents the kind of education innovation for which MIT has become renowned. It's also on a scale on which few other peer schools can embark."

The Teamwork Module: An Example of a Gordon Program Resource at Work

Seeking to impact positively the education of all MIT undergraduate engineering students, the Gordon ELP has created a variety of resources – some of which will help faculty run their project-based learning subjects more smoothly.

For example, frustrated by the inability of some of his freshmen students to work productively in groups of three to build experiments that let them explore principles of electromagnetic energy conversion, Professor Steven Leeb (EECS and MechE, and MacVicar Faculty Fellow) turned recently for help to the Gordon ELP. The Teamwork Module described below played a pivotal role in the success

of the teams into which Prof. Leeb divided freshmen in his subject, Physics of Energy (4.A22, 6.A47, and 6.A48), co-taught with Professors Jim Kirtley and Les Norford.

"Essentially all of my teaching centers around engineering design-build-evaluate activities for students. In my freshman seminar we challenge the freshmen to work in groups of three to build experiments that let them explore principles of electromagnetic energy conversion.

"We've traditionally handled 'teamwork teaching' in an ad hoc way, applauding good results and working to correct problems as they arose. The Gordon ELP Teamwork module was a real step up. It provided a logical framework for engaging the students in developing good teamwork practices that deliver real results in the laboratory without distracting from the technical learning in class. I'm very pleased and I will definitely keep the module in my quiver for future terms."

Both of the Gordon ELP's modules – the Teamwork module and the Project Engineering module – were designed for use in project-based first-year subjects, though they can be used in any project-based subject, and can be easily tailored to fit any specific subject. Students can complete the activities either outside of class or during class time.

Meeting Another Need: Real-Time Feedback on Team Effectiveness

Another resource the Gordon ELP is poised to provide will help faculty monitor the effectiveness of teams in their subjects in real-time. In his project-based class, 2.009, Professor David Wallace uses peer reviews several times during the term to give students feedback on their performance in teams. Prof. Wallace developed his own system to generate online peer review forms and to process peer review data once the students have completed their reviews. The system also allows for e-mail to be sent to students with review results and generates nicely

formatted Excel-based team reports for instructors.

With some funding from the Gordon ELP, Prof. Wallace is building on the existing code base to develop an online "peer review service" Website that allows faculty or student-run projects to quickly and easily configure and administer team peer reviews. Wizards will guide users through the peer review service.

The system will be offered through the Gordon ELP Website when it is complete (web.mit.edu/gordonelp). If you are interested in testing a pilot version, please contact either Diane Soderholm (dhsoder@mit.edu) or David Wallace (drwallac@mit.edu).

The Bottom Line: Gordon ELP Offers Valuable Resources

For faculty, the Gordon ELP should be seen as a resource and support organization. We seek to support departmental programs and build a foundation of sustainable project-based learning. We have funds available through biannual calls to support aligned educational endeavors.

Whether you use the Teamwork module like Prof. Leeb, the Project Engineering module, or the Peer Review System being developed by Prof. Wallace, Gordon staff can consult with you about enhancing and/or incorporating engineering leadership skills in your subject. The Gordon ELP can also provide senior Gordon Engineering Leaders to serve in your subject as informal team coaches. Regardless of the module used, the Gordon-MIT Engineering Leadership Program's resources are designed to produce positive educational outcomes and help you run your subjects more smoothly.

For more information about the Program, please visit our Website (web.mit.edu/gordonelp) or contact me. For more information about educational resources, contact Diane Soderholm, Education Director, at dhsoder@mit.edu. ■

Edward F. Crawley is a Professor in the Departments of Aeronautics and Astronautics and ESD, and Director of the Gordon Leadership Program (crawley@mit.edu).

letters

The Need for Interdisciplinary Education

To The Faculty Newsletter:

HAVING JUST DEPARTED FROM the Institute faculty meeting, I find myself inspired to write in regard to the discussion generated by the CUP [Committee on the Undergraduate Program] proposal for a change to the HASS requirement of the GIRs. While there are some issues of disagreement amongst us about the best ways to promote our common educational goals, what stood out for me as the most salient feature of the discussion was the impassioned defense I heard of the value of a liberal education, and not just “even” at MIT, but especially at MIT.

I was particularly pleased to hear Prof. Lechtman’s plea for us to be at the forefront of interdisciplinary education, although I do not share her assessment of what she fears is the current proposal’s failure to promote innovation in this regard. Let me explain by way of the example I know best, drawn from my own teaching experience, although I am hardly the only example one might give.

I am by training an economic historian, with graduate degrees in both disciplines. In addition to my regular connections to these two fields, I have taught in Women’s and Gender Studies, guest lectured for colleagues in Literature and Theater Arts, co-taught a seminar in social science research methods for Sloan and Engineering Systems Design doctoral students, and, most recently, co-taught a cohort of engineers for the MIT-Portugal program. Like Prof. Lechtman, I am a true believer, and extremely grateful that MIT has historically made space for people like us whose feet are in more than one door.

My current HASS-d subject, a comparative history of the medieval economy, is destined, I think, for a home in what would be the new Social Science category if the GIR reform moves forward. My course is organized around a central question: “How does an economic and cultural backwater like Europe come to dominate the global economy?” But it has a shadow question as well, which is: “Why isn’t the whole world developed?” These are clearly and fundamentally concerns of the social sciences and I don’t anticipate opposition to my category allocation. However, this course also relies heavily on content and skills that more properly belong to both the arts and the humanities. Source material is limited for the early Middle Ages, so we must be creative. I have students read selections from hagiographies (*Saint’s Lives*) to let them practice ferreting out insights into economic and social life from documents never intended for that purpose. This requires that they understand the genre itself; how, why and by whom such narratives were produced, what features are likely to be stylized across the genre, and what are likely to yield “true” historical information. These reading skills are, of course, at the core of the humanistic enterprise. This class also features a unit on the Gothic cathedral building movement of the High Middle Ages. My particular interest is in how essentially agrarian economies with relatively low crop yields came to build such magnificent and enduring monuments. But the full weight of this question can only be appreciated if the buildings themselves are first appreciated – as feats of geometric design and engineering, as aesthetic masterpieces, and as deeply pious

expressions of faith in a universal God.

My belief that the economy and the quality of artistic production are linked finds yet another example in my course. Consider the much-appreciated *oeuvre* of the Dutch Masters of Holland’s so-called “golden age.” I have yet to encounter a student who has never heard of Rembrandt or Vermeer. What our students are unlikely to know is that there were literally millions of paintings produced in the middle decades of the seventeenth century in and around the urban core of the Dutch Republic, the vast majority of which are no longer extant, and deservedly so. This incredible volume of (mostly cheap and uninspired) paintings was produced to meet the growing consumer demand for household decoration by a newly emergent middle class. The masterpieces we commemorate in collections around the world today are merely the very top of what was in fact a mass production industry. Quality emerged then out of quantity, just as the Gothic achievement emerged out of a burgeoning urban economy based on something as prosaic as woolen textile production.

The point of this teaching exercise is not to belittle the singular achievements of the master builders of Chartres, or of Rembrandt and Vermeer, that is to say, to discount creative genius. Rather, my point is precisely the opposite – to remind our students of the tragedy of potential genius so often buried by poverty. Armed with the knowledge that it takes moments of broad societal opportunity for genius to fully emerge, it is my hope that our students will go out into the world with a changed sense of purpose. Some of them

will be motivated to build, others to create works of art, yet others to study more history to understand better the sources of the blessed moments of cultural efflorescence (or perhaps just as importantly to comprehend what it is that kills them). Some of our students will be stirred up to take political action and yet others to pursue the study and practice of poverty eradication, as doctors, economists, policy wonks, or writers. As an educator I'm not

at all fussy which of these tacks they decide to take, so long as they come to appreciate what is at stake for all of us. And they will need the arts, humanities, and social sciences together (along with their scientific and technical knowledge and problem-solving skills) to be successful in these various endeavors.

Dividing the HASS curriculum broadly into the (admittedly traditional) categories of Arts, Humanities, and Social Sciences

won't stifle this kind of learning, but uninspired classrooms easily could. As long as we have a system in place whose rules require copious management on the part of faculty, and which slots students reluctantly into classes that just happen to fit all of the relevant constraints, we put at risk the kind of teaching we really want to do.

Anne EC McCants
Professor of History and Head
History Section

MIT 150 Exhibit to Celebrate Institute's 150th Birthday

MIT 150 WILL BE A major exhibit at the MIT Museum celebrating the Institute's 150th birthday in 2011. What makes it particularly exciting, is that the Museum is making a determined effort to have the entire MIT community nominate and comment on the artifacts for the exhibit.

Highlighting what makes the Institute unique, and giving everyone a chance to tell their favorite MIT stories, the project should function also as a community-building exercise.

Faculty, students, staff, alumni, and anyone else can nominate objects for the exhibit at museum.mit.edu/150. In addition, everyone can comment on any other artifact, and starting this summer they can help to winnow down to 150 the especially fabulous artifacts that will be displayed starting in early 2011.

Some early nominations are in already. For instance, David Mindell (faculty director for the overall 150th celebrations) nominated the Differential Analyzer, MIT's first computer, built by Vannevar Bush and his students in the 1930s. Sherry

Turkle suggested the LOGO Turtle, the first robot that employed the LOGO programming language, built at the Artificial Intelligence Lab in 1970. Walter Lewin proposed OpenCourseware. And several folks have brought up hacks, especially the police cruiser that appeared on the Dome.

Pick Your Favorite Piece of MIT History

As the Institute lays the groundwork for celebrating its 150th birthday in 2011, one truly unique feature of the accompanying MIT Museum exhibit is the ability of the extended MIT community to participate in deciding just what should be included.

- The exhibit Website, at museum.mit.edu/150, is the primary way to nominate and comment on objects. The Website will showcase all nominated objects, on an ongoing basis.
- People, places, or things may be nominated to illustrate the Institute's history, culture, and contributions to society.

- Individuals may also act as "do-it-yourself" museum curators and comment on other objects nominated for the exhibition.

- During the summer of 2009, Website visitors may begin voting on their favorite artifacts, helping to narrow down the field for a selection of 150 meaningful and compelling objects. Additionally, visitors will be able to make suggestions for people inside or outside the Institute who can offer particularly insightful and colorful comments on those 150 artifacts.

"The MIT 150 exhibit is an opportunity for the entire MIT community to help select objects that represent what the Institute is all about," notes John Durant, Director of the MIT Museum. "It aims to capture the Institute's unique qualities – past, present, and future," adds Deborah Douglas, Curator of Science and Technology. "Innovation is not a time-bound concept." ■

The Future of Medical Care?



The Future of Medical Care?