

The MIT Faculty Newsletter

Vol. XV No. 5

April/May 2003

Committee on Student Life

Building Our MIT Community

Paul A. Lagace

There is remarkable consensus, both inside and outside the Institute, that informal, outside-the-classroom contact between faculty and students enriches the education and personal growth of our students.

Despite this consensus, there is evidence from across our campus that faculty are spending limited time in such interactions that often also lead to a sense of community. It is further noted that the Task Force on Student Life and Learning found that there are weaknesses in our common "MIT/campus-wide" community and that these present an obstacle to the overall educational process.

With these items as background, the Committee on Student Life (CSL) began a process of consultation and dialogue to explore reasons for the weakness of the common community, for the limited participation of faculty in community activities particularly as related to student life, and to explore the relations thereof. In undertaking this effort, the CSL was mindful of the

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Remarks at MIT's 29th Annual Celebration of the Life and Legacy of Dr. Martin Luther King, Jr.

Charles M. Vest

14 February 2003

Introduction

As we gather on this morning in February 2003 to celebrate the life and teachings of Dr. Martin Luther King, there are many things I would like to talk about.

But one topic is of such timeliness and importance to this institution, and to the values of American higher education as I see them, that I shall limit my remarks to addressing it.

Recently, I asked a friend of mine who had attended the World Economic Forum at Davos what his reaction had been to Colin Powell's well-publicized speech there. Here is his answer: "Whether or not I agree with his arguments regarding Iraq, I am really proud that Colin Powell is our Secretary of State."

And as each of us watched as the heartbreaking tragedy of the Space Shuttle Columbia played out, I suspect we had a common reaction: "This

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Rafael Bras New Chair of the Faculty

Newsletter Staff

Professor Rafael L. Bras will begin a two-year term as Chair of the Faculty on June 15, 2003. Professor Bras is the Bacardi and Stockholm Water Foundations Professor in the Departments of Civil and Environmental Engineering and Earth, Atmospheric, and Planetary Sciences.

Rafael, as he is normally called by colleagues, is an MIT "lifer." He came to MIT in 1968 as a freshman and left in January 1975 with a Sc.D in Water Resources and Hydrology. At that point he returned to his native Puerto Rico where he taught engineering in the Mayaguez Campus of the University of Puerto Rico. A call from former CEE Department Head Frank Perkins, interrupting a pick-up basketball game, brought him back to MIT on July 1, 1976 as an assistant professor. Rafael moved through the ranks becoming a full professor in 1984. He was director of the Ralph M. Parsons Laboratory from 1983 to 1991. In 1992 he became head of the Civil and Environmental Engineering

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This issue of the *Faculty Newsletter* continues our look at research at the Institute with overviews of four programs, beginning on Page 18, and through M.I.T. Numbers, throughout the issue. We also introduce a new feature, Poetry in the Faculty Newsletter! (Page 7). In addition, we'd like to welcome our newest member of the *Newsletter* Editorial Board, Heidi Nepf, and encourage other faculty to join us by contacting us at fnl@mit.edu.

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From The Faculty Chair

Final Words

Stephen C. Graves

This is my last column as the Chair of the Faculty. As I don't have a pressing topic to discuss, I thought I'd end with a few observations.

The past two years have been quite challenging for MIT by any measure

With September 11, we were faced with unprecedented questions: How do we secure the campus against a possible terrorist attack? How do we preserve openness on campus and protect our international students, faculty, and staff? How do we maintain community in light of the inevitable tensions? And how should MIT contribute to the war against terrorism? With the war in Iraq, we have had to revisit several of these questions.

At the same time, we have faced a fiscal challenge as our endowment has declined for three consecutive years, dropping by one billion dollars in value.

Finally, there have been attacks on our affirmative action efforts to diversify the campus. In particular, we have been forced to change the admission policies for summer programs that are targeted towards underrepresented minorities. And MIT, along with other universities, awaits the outcome of the Supreme Court case that is likely to decide whether or not we can continue to use race as a factor in admissions.

Unfortunately, I do not foresee any of these issues going away in the near future. As the war on terrorism proceeds, we will still struggle with how to sustain a safe and open campus for an international community. I also am not optimistic that the economy

will turn around soon, and I fear we will see even tighter budget constraints in the immediate future. And even with a favorable ruling from the Supreme Court,

faculty and administration on how MIT should grapple with some of the tough tradeoffs and choices that will undoubtedly arise in the future. From

By far, the worst part of being the faculty chair was dealing with student complaints about violations to our term rules and regulations. Inevitably, these come as a batch at the end of the semester – when time is most precious. In many instances, students have legitimate gripes. Too often, though, the student expresses a fear of repercussions and is unwilling to raise the complaint directly with the faculty; this is a sad state of affairs.

I suspect that our affirmative action efforts will continue to be subject to extreme scrutiny from those with differing viewpoints.

Having said all of this, I have been quite impressed with how our administration has dealt with these challenges – although, possibly, I have been co-opted by all of the good food and camaraderie at the Academic Council. I have found that our administration has approached each of these challenges in a quite deliberate and principled way, guided by our fundamental values as a research-based institute of higher learning. For the most part, the administration has been careful to engage faculty in the consideration of how best to move forward, and has been reasonably sensitive to faculty concerns.

Yet I'd also observe that we have ceded a great amount of authority to the administration. There would be benefit from having more open discussion and debate between the

sitting on the Academic Council over the past two years, I, along with Nancy Hopkins, have had the opportunity to represent a faculty perspective. But we are only two voices among a group of 20, and it can be difficult to represent fairly the full spectrum of faculty views on the various issues. There is power in numbers and I'd suggest that the faculty seek more seats at the table. This would provide for better representation of the faculty, allowing the faculty to have a greater input and providing for more transparency on our decision processes. This would give the faculty at large a better appreciation of the challenges we face, and would provide the administration with a better sense of the faculty.

We need more housing

A year ago, the decision to eliminate crowding in our undergraduate residencies was a bold and courageous move. It sent a strong signal that we

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Final Words

Graves, from preceding page

were serious about improving student life. In particular, as we brought all of the freshmen to campus, we assured them that they would have a normal room and not be relegated to living in a converted lounge or squeezed into an overcrowded room. To fulfill that commitment, the administration made several tough choices, such as limiting the size of the entering class and commandeering some graduate housing for upperclassmen.

I fear though that this commitment to no crowding is impossible to sustain. There is continuing pressure to increase the size of the class we admit. And in order to free up on-campus beds for the next class of freshmen, we need a sizable percentage of upper class students to move off campus, particularly to the independent living groups – which are primarily fraternities. Yet, key indicators suggest that we are unlikely to get the necessary numbers to move. The percentage of women undergraduates continues to increase, and there are fewer off-campus options available to them. There is a long-term trend in which fewer men are joining fraternities. And even for those who do join a fraternity, I suspect many will remain living on campus. Certainly, part of this is because we have made significant investments to improve the on-campus residential system – so why would they move? Finally, the use of graduate housing for undergraduates is not ideal, and there will be increasing pressure and expectations for these beds to be returned to graduate students.

Admittedly we are still in a transient phase as we bring the freshmen to campus, add capacity such as Simmons Hall, and work with the fraternities to try to make them more competitive. Possibly we will be

successful at utilizing the off-campus capacity provided by the independent living groups so that we can achieve no crowding on campus. But I seriously doubt this. From my standpoint, it is absolutely clear that we are in an untenable position. We need more undergraduate housing and we need this as soon as possible. We should be actively making plans for a new undergraduate dormitory.

While on the topic of housing, I can't resist to add that we also need housing options near campus for faculty. In the previous *Faculty Newsletter*, Dean Bob Redwine makes a very compelling argument to use 100 Memorial Drive for subsidized housing for faculty. This is a wonderful idea, the time is right, and we should do it. This would certainly help in attracting and retaining faculty. But more importantly, as Dean Redwine suggests, having as many as 80 faculty members residing there would have unimaginable benefits to our efforts to improve student life and community.

The good and the bad of the job

By far, the worst part of being the faculty chair was dealing with student complaints about violations to our term rules and regulations. Inevitably, these come as a batch at the end of the semester – when time is most precious. In many instances, students have legitimate gripes. Too often, though, the student expresses a fear of repercussions and is unwilling to raise the complaint directly with the faculty; this is a sad state of affairs. My experience has been that most violations are inadvertent, the faculty member is embarrassed by whatever lapse created the violation, and the faculty member is most accommodating in

trying to create a fair resolution, provided the complaint is raised early enough. But it seems that some students are intimidated by the faculty and need some other entity to intervene on their behalf.

I expect there is a better way to deal with this irksome part of the job – but I didn't find it.

The best part of the job was meeting faculty from across the Institute. I continue to be awed by the accomplishments, dedication, and commitment of our faculty. After sitting on the eastern edge of the campus for most of my career here, it is hard to fully appreciate all of the amazing and wonderful things that my colleagues do – but over the past two years, I have had a unique opportunity to learn about and see some of this. It makes me even more proud to be part of MIT.

I have also been most grateful for the service provided by faculty through their participation in our faculty governance system. There has been extraordinary generosity of time and effort on the parts of many – and I wish to thank all, for the great help over these past two years.

I have been asked repeatedly whether or not I enjoy being the faculty chair. I honestly have never known quite how to answer this question. I think service to MIT is an important and critical part of our job as faculty, and I have been willing to do my share. But I am relieved that my term is now done, and I look forward to handing off this assignment to Professor Rafael Bras – who is going to do a great job. Good luck Rafael! I am pleased to become just a full-time faculty member again!♣

[Stephen C. Graves can be reached at sgraves@mit.edu]

Rafael Bras New Chair of the Faculty

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Department, remaining in that position until 2001. During his period at MIT he has enjoyed sabbatical stays at Simon Bolivar University (Venezuela), The International Institute for Applied Systems Analysis (Laxenberg, Austria), the University of Iowa, and Harvard University.

Rafael's research interests have evolved over the years. Originally his emphasis was on random processes, operations research and estimation/control theory applied to problems of water resource systems. By the mid-1980s, his interests shifted to fluvial geomorphology and landscape evolution. Currently, his research group is equally divided between fluvial geomorphology and land-atmosphere interactions. The latter topic deals with how large-scale changes over land, like deforestation, impact weather and climate, and vice versa. Remote sensing, simulation, and nonlinear systems theory are all tools used in the studies.

Privately, and in collaboration with other MIT faculty, Rafael has been a consultant on the protection of the City of Venice against flooding. His research activity, and wonderful students, have kept him busy publishing. He is the author of two

textbooks and over 135 peer-reviewed publications. He is a Fellow of the American Society of Civil Engineers, the American Meteorological society and the American Geophysical Union. Rafael is a member of the National Academy of Engineering and has received several other national and international awards. He serves in an advisory capacity to academic units in Cornell, RPI, Princeton, and Johns Hopkins. Rafael recently received the Public Service Medal for his service to NASA.

Most recently, Rafael's research and educational interests have focused on the Earth System Initiative. This effort, directed by Professors Sallie Chisholm and Kip Hodges, seeks to develop increased scientific and engineering understanding of the complex processes that make life on Earth possible. Terrascope is an alternative freshman core experience organized by ESI. Professors Hodges and Bras teach the Terrascope required subjects.

The job of Chair of the Faculty is not one that Rafael had ever considered. He attributes his acceptance of the job to the persuasive nature and arm-twisting tactics of Professor Alar Toomre. He could not decline a request from his and his oldest son's calculus professor!

During this past year outgoing Chair, Steve Graves, has been showing Professor Bras the "ins and outs" of the job. As part of that learning process, they have been visiting all academic units in the Institute, sensing the interests of the faculty, seeking to set an agenda for the next few years. Those meetings have debated issues of governance, promotions and tenure, diversity in the faculty ranks, quality of life, undergraduate core and graduate education. Professor Bras has been impressed by the diversity of ideas and opinions he has heard. He promises to summarize the experience in an article for the *Faculty Newsletter*.

Professor Bras resides in Lexington with his wife, Patricia. They have two children. Rafael E. is a graduate student at Northwestern University, following his MIT studies in Material Sciences and Engineering. Alejandro is heading to Princeton University as a freshman.

Rafael feels very much honored and humbled by the appointment as Chair of the Faculty. In tackling the challenge he promises to follow his dictum of, in any job, firmly taking on the responsibility and the persona of the position – and having fun.♣

[Rafael L. Bras can be reached at rlblas@mit.edu]

Letters

To The Faculty Newsletter:

Your last newsletter on housing issues was fascinating reading. Of particular interest was the attention given to the difficulties junior faculty face when deciding to come to MIT over other competitive universities. Housing costs in Boston, indeed, must be a challenge for new faculty.

Imagine how difficult it is for

administrative, support, and service staff who have significantly lower salaries, bigger school loans, and smaller annual increases. Luckily for young faculty, they can look forward to the promise of a fat salary by the end of their career to alleviate the pain of early salad days.

Mindy Baughman
Administrative Assistant
Materials Science & Engineering

Erratum

In last issue's "Request for Personal Work May Pose a Conflict of Interest" by Mary Rowe, the words *by faculty* in the following sentence were capitalized due to a proofreading error, and should have read: "From time to time, the ombuds office hears from support staff, graduate students, post-docs, undergraduates, technicians, and others about being asked by faculty to do personal work."

TEACH TALK

MIT Has a Teacher Education Program?

Eric Klopfer

If I had a nickel for every time someone asked me that question, I would have saved up enough by now to raise MIT's endowment back to where it was two years ago. But this question highlights one of the great challenges of the small Teacher Education Program (TEP), which is based in the Department of Urban Studies and Planning (aka Course 11) – how do we get the word out?

The other major institutional challenge associated with the unique nature of the TEP is that no one comes to MIT with the goal of becoming a teacher. While the former of these challenges is one we are still combating (through means such as this piece), the latter has actually been found to be an asset. It is what makes the teachers that MIT produces unique. But first, a bit of background on the TEP.

Jeanne Bamberger, professor of Music, founded the TEP in 1995 to serve the undergraduate students of MIT. The development of this program was motivated not only by the crisis in K-12 education (including shortages in teachers, deficits in teacher quality, and disenfranchisement of students across the K-12 system), but also by a growing interest on the part of MIT students to meet the challenge of this crisis. Many students already work as volunteers in school-based programs through the MIT Public Service Center and other organizations across the campus and the city. Their activities include assisting teachers in teaching science and math in grades K-8, developing and providing support for new curriculum, organizing science fairs, and working one-on-one with special needs students.

The TEP was designed to offer a legitimate academic option for these and other students, along with an opportunity to inform and develop their interests in education. The original format of the program included a sequence of two or three courses at MIT, plus an additional three courses and student teaching taken through Wellesley College. When completed, students in this program are eligible to receive a Massachusetts state teaching license in secondary math or the appropriate science discipline. The courses themselves do not compose a major or minor. The only GIR that they fulfill is that they may be used to partially comprise a HASS concentration.

While many students have availed themselves of the MIT based introductory courses, few have had the time to take the Wellesley courses, which require a full-time spring semester of student teaching (typically in the Cambridge Public Schools). Some students do take advantage of a special opportunity that allows them to return for a fifth year, at a highly discounted rate, to complete their student teaching and other missed courses, but numbers have remained low (approximately one to three per year).

This year, with the help of the MIT Class Funds for Education, the TEP was able to offer an MIT-based alternative to the Wellesley option. In addition to the two introductory classes (which have swelled to their capacity of 30-35 students per semester), students can now take an additional three course sequence (fall/IAP/spring) that includes student teaching and results in Massachusetts state

licensure. The new program has been tailored to fit the schedules of MIT students by placing the full-time teaching load in IAP, reducing the number of hours required in the classroom during the semester. Two master teachers from area schools have taken on the primary teaching responsibilities for the new courses, bringing with them years of classroom teaching experience, and on-the-ground connections to the teaching environments in which the MIT students work. This new version of the program attracted eight students in its first year, and hopefully that number will grow in the coming years.

Given that students don't come to MIT thinking they are going to be teachers, just who are these students that wind up in the TEP? The majority of the students that enter the TEP do not in fact *know* that they want to be teachers, but rather they "*think* that they *might* want to be teachers." Consequently, students in the TEP are given the opportunity to explore careers in teaching by spending time in the classroom, and delving into the field of education. There are other students who are sure that they want to be teachers, but not right away. Many students feel like they would like an opportunity to make a bit more money after leaving college to pay off their student loans before embarking on a career in teaching. This is symptomatic of a larger problem of the K-12 system in which teachers are underpaid. Unfortunately, there is little that the program can do to battle this discrepancy in salaries, other than encouraging the students to eventually come back to teaching.

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MIT Has a Teacher Education Program?

Klopfer, from preceding page

There is one characteristic that is nearly universal in the 30-50 students that go through portions of the TEP each year, and that is that they wonder if they are the only ones at MIT that want to become teachers. As such, the classes often have a component of TA (Teachers Anonymous), where students support each other in pursuing their interests to teach. Part of this doubt arises from a pervasive comment coming from students' peers, parents, and professors – becoming a teacher is a waste of an MIT degree. Most students have not told their parents of their interest in teaching, and many of those who have are strongly discouraged from doing so.

Is teaching a waste of an MIT degree? Would these students (and their students in turn) be better served by majoring in education at some other university? Of course the answer is a resounding NO.

The TEP is based upon the unique contributions that MIT students can bring to the classroom, primarily their strong disciplinary preparation, research experiences, and models of success. Being a great physics teacher is grounded in a firm grasp of physics.

Strong disciplinary knowledge, though, is a necessary, but not sufficient, condition for being a great teacher. Along with this knowledge must come proficiency with different pedagogies and practices, which is where the TEP comes in. Most MIT students have succeeded in school, mastering the requisite test-taking, note-taking, and memorization skills. At the same time, students have limited experience with varied teaching and learning styles.

One of the challenges of the TEP is devising ways to provide students with a broader perspective on learning styles of a diversity of students, and the teaching

methodologies that one can employ to reach them. As such, we build upon the weekly K-12 classroom experiences of the students with activities and discussions that embed them in the roles of teachers and learners and help them construct their own understanding of teaching and learning in these contexts.

As the TEP moves forward we are faced with a changing landscape in K-12 education. The new standards and standardized testing warranted by state initiatives as well as the No Child Left Behind act, demand teachers that are ready to meet these challenges, and programs prepared to enable these teachers to do so. The TEP is constantly adapting to respond to these challenges, and as we do so we can certainly use your help in spreading the word.♣

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Poetry in the Faculty Newsletter!

In this issue we begin a new feature in the *Faculty Newsletter*. We hope to publish poetry by MIT faculty in every issue from now on. Submissions from all regular and irregular faculty are welcome. Send your poems to the poetry editor, David Thorburn, at fnl@mit.edu.

The excerpt below is from *Rub Out* (Pressed Wafer publishers, Boston, 2003) by **Ed Barrett** (ebarrett@mit.edu), senior lecturer in Writing. The book is a trilogy of experimental verse novels: *Rub Out*, a meditation on Whitey Bulger and other Boston mobsters, Concord transcendentalists and the disappearance of a young woman; *Breezy Point*, a monologue set in New York City's seaside community of that name; and *Tell On You*, a prose poem sequence focusing on boxing, Las Vegas comics and a corpse that washes ashore in Brooklyn.

*Nothing toys
of the children
of Boston
Ralph Waldo
(The Rifleman)
Emerson and
Whitey
Thoreau cut shallow
graves in railway
embankments,
children in shifts
they had
buried who sang
Irish*

*airs, stupid sentimental
favorites you couldn't
get out of your
mind if you
heard them
They saw their
desire and their grief
over their desire
buried in the woods
around Boston,
oily light of cars
and Indian arrowheads
rising out of the clay*

Remarks on Dr. Martin Luther King, Jr.

Vest, from Page 1

group of astronauts looks like the students in the hallways of MIT. It looks like America in 2003.” For us, the tragedy was compounded because seeing their images was like looking in a mirror – with pride.

How did Colin Powell become Secretary of State?

And how did Michael Anderson or Kalpana Chawla or Laurel Clark come to be voyagers in space?

They each achieved their goals by talent, determination, and drive – the same way that Rick Husband or Pete McCool or David Brown did it.

They achieved their own goals the same way that MIT alumnus and earlier Secretary of State George Shultz did it. The same way that Buzz Aldrin, Ron McNair, Ken Cameron, Franklin Chang-Diaz, Janice Voss, Cady Coleman, or any of the other 31 astronauts who are MIT graduates did it.

But all of these wonderful people – the pride of our nation – had the *opportunity* to develop their talent and to translate their determination and drive into accomplishment.

In America *education* is our primary vehicle of opportunity to develop human talent, to bring coherence to drive, and to convert determination into accomplishment.

It was not long ago that access to America’s opportunity, and in particular access to our great system of public and private universities, would not have been readily available to Colin Powell or Michael Anderson or Kalpana Chawla or Laurel Clark.

Today it is.

But will it be tomorrow?

Hanging by a Thread

The answer to that question lies at the heart of a landmark legal battle

that will be settled within a few months by the Supreme Court of the United States.

Bankrolled and spurred on by two so-called “watchdog groups,” a lawsuit has been brought against the University of Michigan regarding its policies and processes for admitting students to its Law School, and to its undergraduate College of Literature, Science, and Arts.

The goal of this suit, now before the Supreme Court, is to remove from colleges and universities their freedom to consider race as one of many factors in admitting their students.

On the thread of that seemingly simple phrase, “race as one of many factors,” hangs the fate of opportunity for many future American citizens of color.

On the thread of that seemingly simple phrase, “race as one of many factors,” hangs the ability of MIT to explicitly pursue the goal declared in our Mission Statement:

“MIT is dedicated to providing its students with an education that combines rigorous academic study and the excitement of discovery with the support and intellectual stimulation of a diverse campus community.”

On the thread of that seemingly simple phrase, “race as one of many factors,” hangs the freedom of the faculties of American universities to apply standards and principles of their choosing to the most basic of academic decisions – the decision of who shall study in their university.

That thread – that seemingly simple phrase “race as one of many factors” – was spun by Justice Powell when he wrote the majority opinion of the Supreme Court in the 1978 case *Regents of the University of California vs. Bakke*.

In the next few months, the Rhenquist Court must decide whether that thread will remain whole, or whether in one snip of the judicial scissors they will sever it and let educational opportunity for many students of color crash back to the floor – the floor from which it had been raised with such effort over many decades.

Friends, we must preserve the legal right and moral authority to consider race as one of many factors in college and university admissions, and in other programs and dimensions of our life and learning.

Why I Care

Why do I care? I care because of what I have experienced and learned in a lifetime as a student and educator. And I care because MIT must be a leader and a moral force.

I care because when I look out at the members of the MIT community gathered here, I know where we are and how we got here.

When I began my career as a teaching fellow and then as a young assistant professor at the University of Michigan in the 1960s, it was extraordinary if I had more than one African American student in my classes every couple of years. In fact, it was extraordinary if I had more than one or two women students in a class. And if I had either, it was a lead pipe cinch that they would be one of the best two or three students in the class, because only through unusual drive and commitment would these students have come to study engineering.

In that context, when I look around today at an MIT student body whose undergraduates are 42 percent women, 6 percent African-American, 11 percent

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Remarks on Dr. Martin Luther King, Jr.

Vest, from preceding page

Hispanic American, 2 percent Native American – a student body that is remarkably diverse in so many other dimensions as well – it seems to me that a miracle has happened.

But that is just the point. It is not a miracle. It is not a natural occurrence. It is the result of determined, conscientious effort, over more than three decades, often against seemingly insurmountable odds. It is the result of institutional leadership and occasional courage. It is the result of the determination of innumerable families and communities. The goal was as simple as it was profound: to give every young person the opportunity to succeed.

I can only conclude that despite the length of the journey, our nation is a better place than it was three decades ago.

But my own journey and experience is not just one of watching numbers move slowly in the right direction. It is one of direct and meaningful personal benefit from diversity.

I grew up in West Virginia – a border state not quite of the South, but not quite of the North either.

I attended racially segregated schools until I was in junior high school. Our schools were desegregated in one fell swoop a year or so ahead of *Brown v. Board of Education*. I came quickly to value and learn from the new classmates who joined us. I remember when our high school football coach drilled us on how to protect our black teammates should they be attacked in some of the more rural towns in which we were to play.

My first science teacher, who was a big inspiration, was black. My high school physics teacher was a woman. My closest friend in graduate school was from India. My Ph.D advisor was

from Turkey. My closest colleagues as a young professor were from Taiwan, Hungary, and Turkey. My own father grew up in a German-speaking household.

I know that I am richer, that my worldview is more balanced, and that my ability to do my job and live my life has been greatly enhanced by these and by so many more personal experiences that we can file under the heading of diversity.

Most of these things may seem to the students with us today to be like the air you breathe or the water you drink. “What’s the big deal?” you might ask.

Well, it is a big deal because it hasn’t always been that way.

It got that way, as I said, because of determined, conscientious effort, over more than three decades, often against seemingly insurmountable odds.

But race still matters in America. There are still forces that drive racial isolation. We haven’t reached the day when we will truly have a race-blind society. We hope we will, but we haven’t. And we must not put our head in the sand, declare victory, and let 30 years of progress slide through our fingers.

Experience in California and elsewhere shows that when race is removed as an explicit factor among many in admission decisions, minority opportunity in the most competitive institutions suffers.

That is why I care about preserving the right of colleges and universities to consider race as one of many factors in our admissions and in our ethos.

Why do I care? I care because MIT for decades has been a leader in building the diversity of our own community and of the engineering and science workforce and leadership

of America. And it is not going to lose that edge on my watch.

MIT has historically been a leader. And more broadly, across U.S. universities it was engineering schools that tended to lead the way. In the early 1970s, we established outreach programs like MITE²S to attract young Hispanic-American, African-American, and Native American high school students to the engineering profession – a career that tended not to benefit from a high degree of awareness in their communities.

I don’t believe that we saw this task as one of political orientation or ideology. We saw it as an important duty to the nation. We saw it as a problem to be solved – a design to be improved. It flowed naturally from our connection to industry. And industry provided, and continues to provide, much of the financial support and summer experiences that make these programs work.

In supporting these programs and our admissions policies, corporations have not done so because they are liberals or conservatives, Democrats or Republicans. They support them because they understand the world is racially diverse. And if they are to understand their customers, produce well-designed, relevant products, and market them effectively, they need the perspectives and experiences of a diverse workforce and leadership.

But we also must contend with today’s legal landscape – with the law of the land.

During the last several months, we at MIT have learned this the hard way.

A complaint filed against us led to a review of two MIT pre-college summer programs by the U.S. Department of Education’s Office of Civil Rights.

(Continued on next page)

Remarks on Dr. Martin Luther King, Jr.

Vest, from preceding page

The two highly-valued programs are well known to all of you – MITE²S (Minority Introduction to Engineering, Entrepreneurship, and Science) and Interphase.

MITE²S is an outreach program that provides intense education and career inspiration for high school juniors interested in science, mathematics, and engineering. Interphase is a bridge program for incoming MIT freshmen.

We at MIT are very proud of the decades of accomplishment of these two programs. They have served hundreds of promising young men and women very well.

We pledge to you that they will continue to serve promising minority students in the future.

But, our rigorous examination, and the best advice of every legal expert we sought out, was unequivocal – and led us to conclude that we should not continue to limit participation in these programs only to underrepresented minority students.

Therefore, we will broaden the selection criteria to include other students whose backgrounds may otherwise stand in the way of their studying science and engineering. But as we do so, we will find ways to continue to meet the underlying goal of fostering the education and opportunities of as many bright underrepresented minority students as possible. This is MIT, after all, and I am confident that with the help of our faculty and students, we will continue to exercise the leadership and build the programs that will do just that. And we will be as proud of these programs in the future as we are today.

* * *

Much has been written about the value of diversity to the education of all students on American campuses. Its value is well documented by serious social science as well as by the more anecdotal, experiential testimony of students and graduates. But most such studies have tended to focus on the liberal arts, and on the professions of law and medicine.

But what do we think here at MIT, with our pervasive environment of science and engineering?

We know statistically what students at MIT think. Our surveys find that almost 70 percent of the MIT Class of 2002 believed that relating well to people of different races, cultures, and religions is either very important or essential. Less than 5 percent considered it not important.

Furthermore, 53 percent of the Class of 2002 felt that their ability to relate well to people of different races, cultures, and religions was stronger or much stronger than when they arrived at MIT as freshmen. Less than 2 percent felt weaker in this regard than when they arrived.

Does this mean that all students at MIT hold the same beliefs about affirmative action and race conscious policies in admissions, and so forth?

Of course not. Our community has a wide range of views, and I would have it no other way. But the data show that we have an extremely strong consensus on the goal and value of diversity.

Achieving the Goal

How do we achieve that goal?

Schools like MIT or Stanford University first establish which of their applicants cross a high bar of quality, based on measures such as grades, test scores, and class rank – regardless of their race or any other characteristics.

Then we make difficult, subjective choices from among those applicants who crossed the high bar by assessing as best we can the whole person. Race is one of many factors considered at this stage to build an understanding of who each person is, and the context in which they have demonstrated accomplishment, creativity, and drive.

Imagine, if you will, that you are working on admitting the MIT class of 2008. You are preparing to read and evaluate the folders of thousands of applicants. You have the task of selecting only about 15 percent from a pool of young men and women who virtually all have outstanding test scores and grades.

To focus your thinking about selecting the class from among these outstanding applicants, you take many slips of paper and on each one write a characteristic of the class that you consider to be important. You then array them on the table in front of you. The slips have characteristics such as grades, class rank, standardized test scores, geography, gender, economic status, creativity, race, leadership, nationality, risk taking, musical talent, life experiences, cultural background, type of high school, special skills, quality of admission essay, ability to work in teams, evaluations of teachers and counselors, reports of educational counselors, etc.

Suddenly, the arm of the federal government reaches in, grabs the one slip that says “race,” slaps you on the wrist and sternly says “You can consider all of those other factors, but you dare not take race into consideration.”

How can you not consider race? It is an integral part of the individual identity of each applicant and helps us

(Continued on next page)

Remarks on Dr. Martin Luther King, Jr.

Vest, from preceding page

to understand the context of their accomplishments and goals.

That is the world that we will enter if the *Bakke* decision is overturned.

In such a world we will dramatically slow our journey to create a nation that is fair and full of justice for all. It would be a world in which higher education cannot contribute maximally to developing our nation's workforce, its scholars, or the leaders of its next generation across the full sweep of its society.

Where Were You?

Next week MIT will enter a brief as a friend of the court in order to help persuade the Justices of the Supreme Court that for the good of America, our colleges and universities must retain the freedom to consider race as one of many factors when admitting students.

You see, that is what MIT can do. That is how MIT can state "We are present and accounted for." That is how we can and will put our oar in the water.

Our brief will make four primary points:

1. The interest of colleges and universities, including those with strong focus on science and engineering, in achieving diversity of our student bodies and academic communities is compelling in many critical respects.

2. We must retain our freedom to consider race as one of many factors when admitting students in order to achieve this diversity.

3. This is true for both private and public institutions.

4. A diverse workforce and future leadership in science and engineering will be essential to our economic strength.

Will our brief have an impact? Is it an important statement? I think so.

Indeed, last week the CEO and leadership team of one of America's largest and best known corporations sat in a room discussing the importance of the University of Michigan case. One of the group said "No matter which way this case is decided by the Supreme Court, in the future people will look back at our company and say 'Where were you?'" They then decided

to take a public stance. . . by joining the *amicus* brief drafted and organized by MIT.

Indeed, our arguments will be strengthened enormously by the small but extremely important group of *amici* who will join with us as signators to our brief. Joining us will be Stanford University, NACME (National Action Council for Minorities in Engineering), DuPont, IBM, the National Academy of Sciences, and the National Academy of Engineering.

Two great universities, the largest national consortium for advancing engineering careers for minorities, two of the largest and best known technology-based companies in the world, and the two most prestigious academies in science and engineering will be standing together in a highly public manner.

When the question is asked, "Where were you?," MIT's answer will be clear.

Thank you very much.

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Building Our MIT Community

Lagace, from Page 1

finding of the Task Force that promoting student and faculty participation in community activities is probably the most difficult of the many design problems that MIT faces.

The work included considerable internal dialogue, meeting with leaders from the undergraduate and graduate student communities, the faculty, the administration, and the staff, as well as consideration of current student life activities at the Institute, particularly as affiliated with the Office of the Dean for Student Life. Further consideration of this information resulted in identification of “community-building” activities in which faculty could and do participate. A compilation of suggestions from committee members led to a rich dialogue around the thoughts and issues embedded within these suggestions.

This overall process led to the identification of four key findings with regard to the issue of community at the Institute:

1. There is a lack of shared understanding of the meaning of “community” across the Institute;
2. Differences in the models that individuals have of “community” lead to very different and potentially counter-constructive actions in acting as and in building our community;
3. There is wide disagreement as to whether contributing to the Institute community via participation in issues related to student life is an inherent part of being an MIT faculty member; and
4. There continues to be a distinct lack of career rewards for faculty contributions to the Institute

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community via participation in issues related to student life.

The Committee recommends that the first step in addressing these issues is to create a campus-wide forum through which all members of the Institute can engage in open dialogue to determine what it means to be part of a common MIT community and to develop ways to build that community with full faculty participation. The success of such a forum requires participation from all parts of the Institute – administration, faculty, staff, graduate students, and undergraduate students. Of particular note to faculty is working with students to define joint expectations in working towards and as community, and working with the administration to define expectations of the level of faculty involvement in community-building activities and associated rewards.

To help seed our Institute-wide dialogue, initial thoughts on these

overall issues, including potential attributes of the Institute community, potential qualities of “Institute community-building” activities, and some possible activities of this nature, are conveyed in a white paper entitled “Community” written by the Committee on Student Life. This can be found at the faculty Website web.mit.edu/faculty/reports/csl.pdf. These thoughts are not meant to be definitive answers to the issues related to community-building and student life within our Institute, but are provided as stimuli to heighten awareness and to form the foundation for a rejuvenated dialogue across the entire Institute around these issues.

We hope that you as faculty at MIT will take ownership of these key items and engage in open dialogue with colleagues, students, and all members of our broad Institute community.

For the Committee on Student Life.✦
[Paul A. Lagace can be reached at pal@mit.edu]

To “Humanize” the Institute

John Hildebidle

Some years ago, Paul Gray named a task force to investigate student life and learning. That group came to the conclusion that, among other things, there was a lack at MIT of productive contact between faculty and students. In due time, a faculty committee, the Committee on Student Life (CSL), began investigating ways to address that lack. Without presuming to summarize the findings and recommendations of the CSL, of which I have been a member, I may be so bold here as to offer the Hildebidle Handy No Heavy Lifting Guide to “Humanizing” the Institute.

I start from the premise that all of us – undergraduates, graduate students, staff, faculty, and administrators – have fewer financial resources than might be ideal, and are even more crucially short of extra time and energy. My own experience has been, at times, one of frustration, when I organize encounters with students (advisees usually, sometimes members of a class) only to find it nearly impossible to agree upon a mutually convenient time. Even more demoralizing, when I have managed to scrounge and connive some funding – enough, say, for a round of pizza – students who expressed initial enthusiasm manage to develop schedule conflicts that keep them away.

But the cleverness of the plan below is that most of it demands no real expenditure of time, and no particular advance planning or coordination of schedules. The CSL did, however, come to the conclusion that student-faculty contact must be informal, extracurricular, and recurrent.

1. Make it a point, once a week or so, to walk the length of the Infinite Corridor, greeting warmly anyone who

is even vaguely familiar (and perhaps even saying hello to the occasional stranger, or picking up a clue about shared interests – a baseball cap, a sweatshirt from a college you happen to know well, a book in an area of your interest or expertise).

2. Have lunch in one of the two main student dining facilities, Walker or Lobdell. Talk to the people who end up at the same table as you, and perhaps even seek out some former or present students. The best course would be to do this regularly – perhaps even once a week.

3. Go to Stratton, to the lounge area newly-established on the ground floor. Take along a magazine or a newspaper or a book (preferably nothing too technical). Sit and read and allow yourself to fall into conversation. Again, this would be best done several times.

4. Let it be known, at the first meeting of your courses, that you’d like students to inform you about extracurricular activities they will be involved with – theater, MITSOS, athletics. Have them inform you of performances or games, and attend them.

5. I have little contact with grad students, but I do know that Ashdown House has regular, informal evening gatherings. Ask your teaching or lab assistants whether they are aware of such gatherings, and get yourself invited – I’d wager a few e-mails to the relevant House Masters is all it would take.

Assuming that you already eat regularly, that even the busiest of us can use the occasional break and a bit of exercise, and that the range of activities on campus (lectures, films, plays, musicals, sports) is wide enough to suit almost anyone’s fancy, none of

these gestures should radically inconvenience us. But then, a sea change in the atmosphere of this institution is what I am proposing, and it would be naïve to argue that such a change won’t involve any effort. Two steps are plausible, to my way of thinking:

1. Get a membership in the Z-center, and use it. “The campus that sweats together gels,” is my personal mantra. Half an hour on the Nautilus or the stationary bikes will help your cardiovascular system no end, and a few cordial words exchanged with the person next to you will repay the investment, in human terms.

2. Sign up to offer a freshman advisee seminar. It is easy enough to think of something you’d like to talk about with a group of extremely bright young people (else why are you a college professor?). It can as easily be an avocation as your major professional interest – sports, film, music, art, television. The chance to meet and advise the newest members of our community is a richly rewarding one, in my experience; and it establishes lasting connections (advisees from years past have a way of dropping by to bring you up to date on their lives, and – yes – to ask for letters of recommendation). It is a way to do authentic good, and the cost in time and effort is remarkably small: two hours a week, or less, during the fall term.

The fact is that “community” will not just happen, nor can it be farmed out to distinct areas of the Institute. It will take continuing effort on the part of all of us. But the evidence is pretty clear – it will pay off in the classroom, as well.♣

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International Education at MIT

Bernd Widdig

How do we prepare our students for a global economy and an increasingly international research environment? What skills and knowledge do they need to act as responsible, sensible, and respected leaders in this ever more international context?

MIT's own success story is closely linked to a process of internationalization over the last decades. Thirty-seven percent of our graduate students are international and come from 108 foreign countries. About 25 percent of the entire student body are international students. I would guess that at least a similar portion of the faculty was originally born outside the United States.

Globally operating companies are no different from MIT in this respect. They also seek talent on an international market of human resources. And they increasingly ask: Do these young engineers and scientists have the skills, the experiences, and willingness to work in cross-cultural teams, do they understand cultures other than their own, can they serve as mediators between company operations in different countries?

During the last few years, MIT has taken much needed steps to integrate the learning and practice of communication skills into the curriculum. The new communication requirement sends our students a clear signal about what our alumni have told us again and again: Being an excellent engineer and scientist encompasses the ability to communicate highly technical work to other people who might not always be engineers themselves. Yet this goal would remain incomplete if we did not add an international component to it: communication for future leaders in science and engineering means, more than ever, communication across borders and cultures. At this point, international education comes into play. We must offer our students opportunities to learn about other countries including their languages and cultures, and they should understand how "globalization" or "internationalization"

affects their lives and the lives of citizens around the world. All of this seems to make complete educational sense, yet creating opportunities for our students to engage in international experiences has been by no means as common at MIT as it has been at most other universities in the country. But things are changing.

CMI, the alliance between MIT and Cambridge University, has opened some exciting opportunities. About 35 students from each side of the ocean are currently participating in this highly structured program. Students, as CMI describes it, can have "the best of both worlds" by participating in the unique and different learning environments of MIT and Cambridge University. CMI is a great step forward for those students who would like to study abroad without leaving the borders of the English speaking world, especially if one considers that in recent years only about 20 MIT students per year participated in traditional study abroad programs.

The other cornerstone program of international education at MIT is MISTI—the MIT International Science and Technology Initiatives. MISTI's idea of international education centers around two key principles: careful academic preparation before students leave campus and a hands-on learning experience while they are abroad. A whole range of courses offered in different departments and sections at MIT give students the necessary background, including competence in the host countries' language. Students are then placed in carefully arranged internships in companies and research labs around the world. MISTI is open to undergraduates, graduates, and recent alumni from all schools at MIT. At the moment, MISTI has country programs in China, France, Germany, India, Italy, Japan, and Singapore, and sends about 160 students per year around the world.

The origins of MISTI go back to 1981 when Richard Samuels, then a young

assistant professor in Political Science at MIT, founded the MIT-Japan Program to encourage students to learn Japanese and subsequently work as interns in Japanese companies, to get hands-on experience of what their famous new production technologies were all about. The MIT-Japan Program was a model for a second wave of international programs that started in the mid-nineties. In 1994, under the leadership of Professor Suzanne Berger and the support of Provost Mark Wrighton, MISTI was founded and programs in China and Germany were established. The MIT-Japan Program became part of MISTI and with the expertise of the program's long-time managing director, Pat Gercik, new initiatives were started in France, India, and Italy.

What makes MISTI different from other international programs is its deep and lasting network of relationships with the corporate sector. Around 90 American and international companies and research labs are partnering with the different country programs. A bilingual coordinator for each program is in constant contact with these companies to ensure that each internship matches the expectation of the company and the student. Many of the more than 1300 students who participated in our programs over the years report to us that MISTI provided them with one of the richest learning experiences at MIT: combining what they learned in different humanities and social sciences courses about another country with hands-on and challenging work in a company lab.

The importance of such learning "in the real world" is being stressed more and more in engineering education. Beyond the exposure to a different culture with different modes of tackling a problem, MISTI students become aware of the dramatically changing role of engineers and scientists in companies. The School of Engineering recently started an ambitious

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International Education at MIT

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program that is designed to give students just that view on the changing tasks of an engineer. UPOP, the Undergraduate Practice Opportunity Program, plans to send eventually more than half of the school's sophomores into summer internships, albeit almost all within the United States. And FASIP, the Freshman/Alumni Summer Internship Program, seeks to interest first-year students in getting a quality practical experience. In many respects, MIT now has a whole menu of internship programs in place, from the beginner level to a challenging international internship with a MISTI country program.

Where should we go from here? While student demand is strong and a good number of faculty members are in support, it is surprising that there are still many barriers for international programs on campus. Many of our students tell us that they would like to go abroad but that MIT makes it quite difficult. Part of this is myth, part is reality. Let me start with the role of faculty advisors. I am not sure whether to put this in the "myth" or "reality" category, but there seem to be some faculty members who tell students that a) learning a foreign language is a waste of time for them, because everybody speaks English in their field, or b) that "A lab is a lab," regardless whether you do research in Beijing, Boston, or Berlin, or c) that venturing out beyond this campus is a bad idea, anyhow, because MIT is the best in every possible way.

Learning a foreign language as an adult is without doubt a time- and energy-intensive activity. We jump into the cold water of linguistic helplessness. One minute we revel at our own eloquence, the next minute we stumble along with our rough phrases of French, Japanese, or German. The euphoria that sets in when we finally get the ball across the net, when we play our first good game in a foreign language is sometimes forgotten. The belief that

you can manage with English across the world, has only limited validity. Some time ago, I visited Osram Sylvania (yes, lightbulbs) with my students to explore how Sylvania's acquisition by Siemens, the German multinational corporation, had affected the work of middle managers. They told us how grateful they were that Siemens' company language was English. "No need to learn German then," I remarked. One engineer replied that, indeed, for the quarterly meetings in Munich it was not necessary. Then he added: "But we know that the real important stuff is being discussed before and after the meeting, in the hallway, and after hours in the bar. Then our colleagues from Munich switch to German and we are left in the dark. That's why our boss learned German." In other words, to visit a conference, to have limited technical interaction, English may be just fine. For everything else, a foreign language is priceless.

What about the "A Lab is a Lab" assumption? When I relate this argument to colleagues who have spent time in foreign research and business environments, they often begin telling me amusing and sometimes not so amusing anecdotes about the considerable cultural differences in how people from other countries teach, organize their research, even think about the same problem. Physics and engineering follows the same principles of nature, but people in different cultures organize their work around it very differently. And that is vitally important for our students to realize if they want to be successfully engaged in international divisions of labor.

The third point is certainly the expression of justified pride, yet it contains also a heavy dose of unhealthy arrogance. I believe that carefully selected partners from industry, in research, but also top universities in other countries, can provide our students with valuable learning

experiences that can complement the education here at the Institute.

Moving a bit more into the category of "reality" we encounter certain structural barriers that make it difficult for our students to pursue international experiences. First of all, too few MIT faculty members are aware that these international programs exist. I hope this article will result in some new contacts with those of you who are interested in international education for your students. Many of you have long-standing relationships with companies and research labs around the world and your experience is invaluable for building high-quality international programs at MIT.

Secondly, we should encourage students to take a semester off if they have a chance, to do a well-prepared internship abroad. Too many students only go for the summer abroad, which limits both the depth of the cultural experience as well as the scope of interesting work that can be done in an internship. They believe that they become stigmatized by not graduating with their other classmates or they are concerned that they cannot take required courses in the right sequence. These problems can be solved with intelligent planning and an encouraging voice from departments and the central administration.

I believe international education at MIT is just starting, and given the many enthusiastic responses from students, faculty, and participating companies around the world we should take this energy and further develop and deepen such programs as CMI or MISTI. In the end, these initiatives serve a fundamental educational goal beyond increased chances on the job market and the familiarity with international networks of research. As one of our students told me after returning: "I never thought that the best place for me to learn about myself and my country was abroad." ❖

[Bernd Widdig can be reached at bwiddig@mit.edu]

Energy Research at MIT: A Scenario for Growth

David H. Marks

There is no Department of Energy at MIT, nor should there be. Because the most pressing problems in this area require complex solutions requiring many perspectives, it makes no sense to try to draw a disciplinary boundary around energy. As MIT has evolved (over one-third of our faculty has been hired in the last six years, which reflects a major shift towards biological sciences and nano- and information technologies) many of the experts in traditional energy-related areas have left and not been replaced in kind.

Energy technologies are considered “mature,” and lacking the kind of breakthrough intellectual challenges appropriate for MIT research and education. At the same time, however, energy issues have become a growing concern for industry, government, and the students they will hire to help them get more from existing energy sources, seek new sources, and devise more efficient products and processes. For this reason, MIT needs to build a coordinated disciplinary and cross-disciplinary focus on energy science, technology, and policy.

I would argue that – far from being mature – energy science and engineering for the foreseeable future is barely out of infancy. The twenty-first century struggle to reconcile environmental sustainability with the world’s growing energy needs may, in fact, depend on discoveries and synergies we have yet to even imagine.

Energy-related research affiliated with the Laboratory for Energy and the Environment (LFEE) and scattered among other DLCs, are promising. MIT researchers are looking at various aspects of fuel cell technology, fusion energy, solar, wind, and biomass

energy. Eight of the “ignition” grants awarded by the Deshpande Center in the School of Engineering will spur research in two areas: solar cell circuitry, and electrode designs for metal-air batteries and fuel cells. Faculty members in the departments of Chemistry, Chemical Engineering, Materials Science and Engineering, Nuclear Engineering, and others are working on basic and engineering science projects that might plausibly become elements of new energy systems.

Meanwhile, as a new MIT/LFEE study released a few weeks ago cautions, alternative energy may not take over for a long time. Until then, research and distribution of improved current technologies, such as gasoline-electric hybrid vehicles, can help preserve and possibly even reverse the degradation of some environmental systems. Also at LFEE, interest is growing in “smart wells-smart fields” technologies to maximize the potential of oil fields while minimizing their environmental impact. The Carbon Sequestration Initiative, also housed at LFEE, is supported by a growing industrial consortium currently including nine major utility, energy, and automobile companies.

Interest in alternative energy systems is cropping up throughout the Institute. GM recently sponsored a Fuel-Cell Case Competition for Sloan School students. Just yesterday, March 12, Institute Professor John Deutch (Chemistry) spoke to the bi-weekly LFEE faculty-student seminar on fuel cell system applications; organizers had to scramble to find a room big enough for all attendees. Later in the day, Professor Jefferson Tester (Chemical Engineering) participated

in a well attended public forum at MIT on energy and national security. The Reuters news agency picked up and distributed internationally a synopsis of the alternative energy study mentioned above. Next week, a former U.S. Assistant Secretary of Defense will come to MIT to discuss “Solar Power and the Hydrogen Economy” while, on the other side of campus, a Plasma Fusion Center lecture series speaker leads a discussion of development paths for fusion energy. MIT’s own facilities management group is working with LFEE researchers, UROPS, state funders, local communities, and industry on a project to foster acceptance of solar technologies.

Some might argue that these scholars resemble the blind men describing an elephant – what would the ideal energy system look like at mid-century? It may be time to organize and channel this proliferation of ideas and enthusiasm into an Institute-wide energy initiative. How else will we resolve some clearer images of system options for the future, options that respect the potential of all possible technologies? An LFEE meeting in January drew some 25 faculty members and research staff to brainstorm how to organize and stimulate energy research at MIT.

The search for new energy pathways will require advanced work in information technology, nano-technology, robotics, materials and material systems, chemistry, biology, and physics. Large-scale integrated systems studies emphasizing interactions among potential technologies and regulatory and business strategies, as well as organization and knowledge

(Continued on next page)

**Energy Research at MIT:
A Scenario for Growth**

Marks, from preceding page

management studies, will be essential to any effort.

It has been argued that the nation could benefit from a “Manhattan Project” for an energy system that would free us from dependence on fossil fuels within a very short time. There are some striking parallels, and equally striking differences. The most important similarity from an MIT perspective is that such an initiative would require the massing of immense scientific and engineering talent. And, I would add, the integration of experts in policy making, economics, and management from the outset. Unless it can be effectively produced, distributed and regulated, any new technology will remain a laboratory curiosity, nothing more.

Unlike the Manhattan Project, an Energy for the 21st Century Project could take place in an atmosphere of transparency and neutrality, in the finest tradition of academic research. The most important difference is that investigators based in a university such as MIT do their work free from

ideological allegiances (as much as anyone can).

[A note on cynicism: It is easy to be discouraged about the exaggerated claims of politicians with constituencies to maintain, of corporate advertising or willingness to fund research, and certainly of “neutrality” and the “objectivity” of academic research. However, it remains a goal to strive for, even if it is never entirely achieved.]

Coupled with the Energy for the 21st Century Project might be another idea borrowed from the Greatest Generation, the Marshall Plan. Whether or not one believes that the current yawning gap between the developed and developing countries is the result of climate, imperialism, or chance, the fact remains that underdevelopment creates political chaos, and chaos creates strife which can overflow in unpredictable directions. The transfer of non-destructive energy technologies would go far toward promoting healthy development, enabling people to be productive, secure, and at home.

A massive initiative of this kind would unleash power for sustainable development world wide. This would not benefit the South alone. The development and transfer of non-destructive energy technologies could free the U.S. from dependence on foreign resources and their coercive use; involvement in international tensions arising from environmental degradation such as transboundary migration; and profound skepticism around the world about our commitment to good global citizenship.

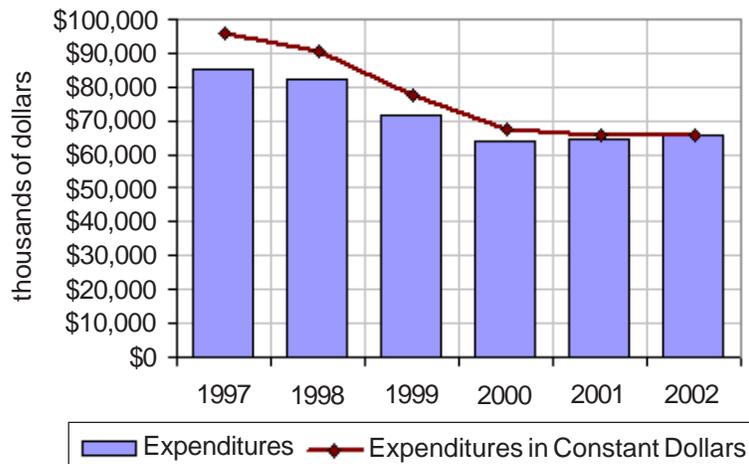
If we limit our research only to refining the refineries, we will certainly achieve some useful short-term gains; they are necessary to hold the line, until more powerful and appropriate technology can be deployed. Fast-tracking MIT research into new energy science and technology will not only prepare society for a future we can afford, but also offer genuine intellectual challenges for MIT faculty and students.

It’s what negotiators call a “mutual gains” solution. It’s worth a try.✦
[David H. Marks can be reached at dhmarks@mit.edu]



M.I.T. Numbers

**Research Expenditures on Campus
Department of Energy**



Source: Office of the Provost

Research at MIT

Laboratory for Information and Decision Systems

Vincent W.S. Chan, Lauren Clark, and Robert G. Gallager

The Laboratory for Information and Decision Systems (LIDS) is an interdepartmental laboratory within MIT's School of Engineering dedicated to advancing the fields of systems, communication, signal processing, and control. It is staffed by faculty, researchers, and graduate students primarily from the Department of Electrical Engineering and Computer Science, the Department of Aeronautics and Astronautics, and the Sloan School of Management.

History

LIDS is an outgrowth of the Servomechanisms Laboratory, founded in 1940 by Gordon S. Brown. The "Servo Lab" made major contributions to victory in World War II by developing servomechanisms for military gun-control systems. The work on gun control helped lay the foundations for feedback control, as exemplified in the 1948 textbook *Principles of Servomechanisms*, by Brown and Donald Campbell. These principles were central to postwar developments in areas as diverse as the numerical control of machine tools, chemical process control, and the design of computers.

The Servo Lab's early work also made pioneering contributions to guided missile control, radar, and flight trainer technology. Work broadened in the following decades, leading to major advancements in several areas: digital computation, information transfer and processing, communication theory, data networks, automatic control of air- and spacecraft, air defense systems,

computer-aided design, and economic systems.

In 1959, the Lab changed its name to the Electronic Systems Laboratory (ESL) to reflect its broader focus on systems. In 1978, ESL and the Communication and Information Theory group from the Research Laboratory of Electronics joined to form LIDS. These changes show how far the current laboratory's mission has evolved beyond its narrow, WWII origins and reflect the shift of focus over the years from applications to basic research.

The LIDS Approach

LIDS emphasizes basic knowledge as the foundation for innovation. Students come to the Lab for its offering of a blend of technology and basic science underlying technology. Recognizing that it is usually more difficult to ask the right question than to answer it, LIDS encourages and helps students to define their own research problems.

The intellectual culture at LIDS encourages students, postdocs, and faculty both to develop the conceptual structures of the Lab's system areas and apply these structures to important engineering problems. This is done in a cooperative atmosphere of sharing ideas and questions. This culture is particularly evident each January at the LIDS Student Colloquium, a two-day event at which students present work in a variety of areas.

In the words of one LIDS alumnus: "The approach in LIDS is to understand the core of any problem, and to develop tools and ideas necessary in achieving

this understanding. The abilities and perspectives developed through the LIDS experience transcend any specific application, and as such are of lasting value and transportable to different fields. The accomplishments of the Lab's alumni in industry and academia in a broad range of fields are evidence of the value of its approach."

People

LIDS is home to 130 graduate students and post-doctoral associates from around the world. Research opportunities are also available to undergraduate students. The doctoral students and post-doctoral fellows supported by the Laboratory over the past 60 years represent a who's who of industry and academia in the fields of systems, control, communication, and signal processing.

The faculty at LIDS are recognized leaders in the fields of networks and communication, digital signal processing, optimization, and control. They have authored many widely-used textbooks that impact education worldwide. In addition, both faculty and research staff have written well-known research articles and have won major awards.

In the past two years alone, LIDS professors and researchers have received the Eduard Rhein Foundation's Basic Research Award – Europe's biggest such award (Professor Robert Gallager); the International Telecommunications Innovation Award (Professor Moe Win); the Telecommunications Award

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from the Massachusetts Telecom Council (Professor Vincent W.S. Chan); and numerous best-paper awards, including the Leon K. Kirchmayer Prize Paper Award, presented by the IEEE Board of Directors for the most outstanding paper by an author under 30 (Professor Muriel Medard). In addition, Professor Chan was named Fellow of the Optical Society of America; Professor David Forney was inducted into the Massachusetts Telecom Hall of Fame; and Professor Dimitri Bertsekas received the American Automatic Control Council (AACC) John R. Raggazzini Education Award and was elected into the National Academy of Engineering.

Research

Research at LIDS has a wide range of applications in the communication, computer, control, electronics, and aerospace industries. It falls into four main areas:

- **COMMUNICATION AND NETWORKS:** Research in this area includes fundamental work on networks, information theory, and communication theory. The work extends to applications in satellite, wireless and optical communications, and data networks. The objective is to develop the scientific base needed to design data communication networks that are efficient, robust, and architecturally clean. Wide-area and local-area networks, high-speed networks, and point-to-point and broadcast communication channels are of concern. Topics of current interest include network architectures at all layers; power control; multiple antenna

techniques; network coding; media access control protocols; routing in optical, wireless, and satellite networks; quality of service control; failure recovery; topological design; and the use of pricing as a mechanism for efficient resource allocation.

- **CONTROL AND SYSTEM THEORY:** The control systems group deals with problems related to complete systems analysis design. These include learning and system identification, controller design and optimization, and basic analysis of distributed systems involving the interaction of information and control. Theoretical research quantifies the fundamental limitations and capabilities of learning and feedback control for various classes of systems in the presence of dynamic uncertainty. Application-oriented work includes control architectures for single and multiple unmanned aerial vehicles and controllers for piloting epitaxy in semiconductor manufacturing. The control group is also involved in a research effort focusing on modeling aspects of the nervous system, conducted in collaboration with other laboratories.

- **OPTIMIZATION:** Work in this area looks at analytical and computational methods for solving broad classes of optimization problems arising in engineering and operations research. It has applications in communication networks, control theory, power systems, and computer-aided manufacturing. In addition to traditional subjects in linear, nonlinear, dynamic, convex, and network programming, there is an emphasis on the solution of large-scale problems,

including the application of neuro-dynamic programming methods.

- **STATISTICAL SIGNAL PROCESSING:** This group analyzes complex systems, phenomena, and data subject to uncertainty and statistical variability. Research spans the spectrum from broadly applicable basic theory, methodologies, and algorithms to challenging applications in a broad array of fields. Recent applications for this research include multisensor data assimilation for oceanography, hydrology, and meteorology; biomedical image analysis; object recognition and computer vision; and coordinated sensing and processing of large, distributed arrays of microsensors.

Looking Forward

In late 2003, LIDS will take up residence in the newly completed Ray and Maria Stata Center for Computer, Information, and Intelligence Sciences. LIDS and the Stata Center's other occupants – the Laboratory for Computer Science, the Artificial Intelligence Laboratory, and the Department of Linguistics and Philosophy – will comprise a new academic village that will carry into the twenty-first century the pioneering spirit of Building 20. The “magical incubator,” as Building 20 is sometimes called, occupied the Stata Center site for 55 years and was the breeding ground for many of the great ideas that were born at MIT. ❖

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The Bates Linear Accelerator Center

Richard G. Milner

The Bates Linear Accelerator Center is a national user facility for experimental nuclear physicists funded by the Department of Energy and operated by MIT for over three decades. Bates is situated on an 80-acre site among the rolling hills and trees of Middleton, MA, about 20 miles north of Boston and is administered through MIT's Laboratory for Nuclear Science. Bates has a user community of over 200 physicists from more than 50 institutions world wide. More than 25 physicists associated with seven members of the MIT Physics Department are active in the research program.

The scientific focus at Bates is to study fundamental properties of the proton and light nuclei, using experiments which detect particles arising from the interaction of beams of electrons from specialized targets. Over the last several years, experiments carried out at Bates have provided important new insight into the structure of the proton:

- Using parity violating electron scattering from hydrogen and deuterium, Professor Kowalski and his colleagues have shown that the contribution of *strange* quarks to the proton's magnetism is less than 5%. This is the first experimental information on this question and it eliminates a number of theoretical predictions which had been motivated by previous experimental results at higher energies.

- Using a unique spectrometer system designed and built at Bates, Professors Bernstein and Bertozzi and colleagues have provided a direct determination of the shape of the proton. It is concluded unambiguously that the proton has a slightly non-

spherical shape and that it is likely to be prolate.

particular focus is understanding the distribution of spin in the deuteron



Members of the BLAST collaboration at the detector in the Bates South Hall

At present, a major new experimental program is getting underway at Bates. The Bates Large Acceptance Spectrometer Toroid (BLAST) is a unique new detector which has been designed and constructed by an international collaboration to carry out a program of measurements of electron scattering from internal gas targets in the Bates South Hall Ring. The BLAST experiments required specialized beam and targets which have the quantum mechanical property of being spin polarized. Bates has achieved record-breaking spin polarized electron beams of intensity greater than 100 mA and polarizations of more than 70%.

BLAST will provide new precision information on the distribution of charge and magnetism in the proton, deuteron and helium-3 nuclei. A

and helium-3 nuclei where theoretical calculations are reliable but data are sparse or nonexistent. Professors Bertozzi, Gao, Matthews, Milner, and Redwine and their colleagues at MIT are playing a leadership role in the BLAST program. It is anticipated that data taking with BLAST will continue for the next several years.

Looking at Bates beyond BLAST, there are a number of exciting, new initiatives under development. First, realization of a highly intense x-ray laser at the Bates site is being seriously considered by a team under the leadership of Professor David Moncton. It is proposed that this would be a national user facility with the potential for 20 or more experimental areas. It is widely recognized that such

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a light source with a peak brilliance eight orders of magnitude greater than is presently available in the wave-length region from 100 nm to 0.1 nm would have a high impact across many disciplines, including atomic and fundamental physics, condensed matter physics and materials science, femtochemistry, structural biology, and various fields of engineering. A proposal to develop a conceptual facility design and the detailed scientific case has been submitted to the National Science Foundation.

In addition, Bates physicists have played a leadership role in the development of the science case and preliminary design of the next generation accelerator for the study of the fundamental structure of matter. It is proposed to construct an electron beam to interact with the existing spin

polarized proton and heavy nuclear beams in the Relativistic Heavy Ion Collider at Brookhaven National Laboratory. This machine concept is known as eRHIC and would allow hard electron scattering from the fundamental quark and gluon constituents of nuclear matter with unprecedented precision and scope. At present, a conceptual design for eRHIC is under development.

Since the beginning of the Bates experimental program in 1974, education and training of young physicists has been an important priority. Over 110 Ph.D students have been educated and trained in nuclear science at Bates. These students are widely sought in industry and research laboratories for their problem-solving expertise. Over 25 Bates-educated Ph.Ds are in academic positions world

wide. At present, eight students are analyzing data taken at Bates as part of their Ph.D research. Fourteen graduate students are hard at work on BLAST and will write Ph.D theses on data taken in the next year.

Further, sizable numbers of undergraduate students can be found at Bates each summer working on research projects.

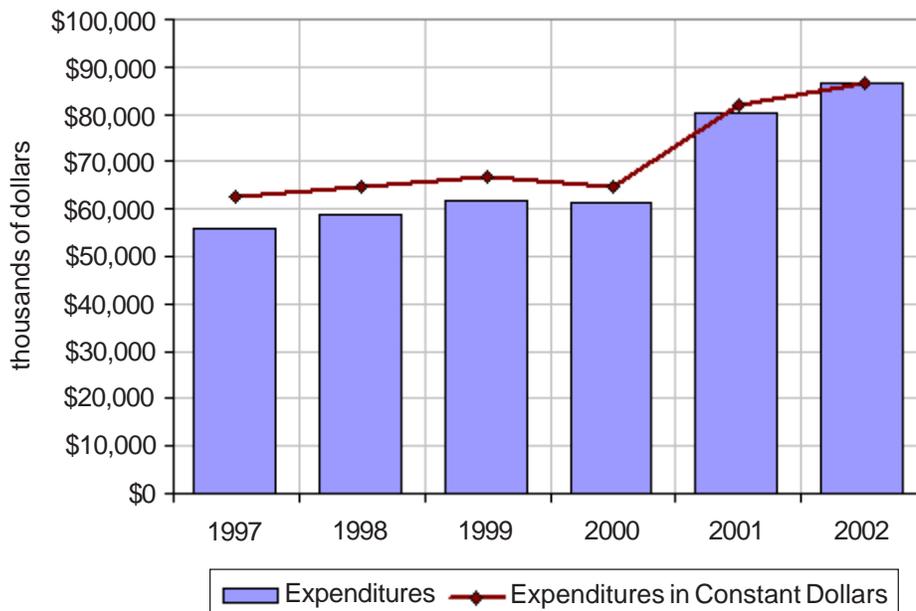
In conclusion, after more than 30 years Bates remains an active center for research and education at MIT. In the next several years, a new generation of students and data will be produced and the stage set for the next evolution of the Center. If you are interested in our programs, feel free to contact me. We are always happy to welcome visitors to Bates.♣

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M.I.T. Numbers

Research Expenditures on Campus Industry



Source: Office of the Provost

Center for Technology, Policy, and Industrial Development

Fred Moavenzadeh

Furthering broadband Internet equity. Uncovering obstacles to build-to-order cars. Ratcheting up lean production to the aerospace enterprise level. These diverse research interests fall under the aegis of the Center for Technology, Policy, and Industrial Development (CTPID). This spring, CTPID research is in the forefront of several new collaborative ventures:

Materials Systems Lab (MSL): PI Joel Clark, professor of Materials Science and Engineering, will co-direct a new joint lab funded by a five-year General Motors Corp. grant. The lab will develop advanced material processing and manufacturing systems for global automotive operations based on MSL-developed models.

Internet and Telecoms Convergence (ITC) Program: PI David Clark, Senior Research Scientist at the Lab for Computer Science, is co-directing a new MIT-wide Communications Futures Program that will draw on ITC's expertise in economic and policy analysis.

MIT Information Quality (MIT IQ): Director Richard Wang, CTPID Principal Research Scientist, this spring launched a certificate program to train information quality professionals with support from the U.S. Navy and industry partners.

Industry and government partnerships like these are key to CTPID's efforts to support global economic growth and advance policies that preserve the environment and benefit society. Founded in 1985, CTPID's 10 programs aim to advance knowledge and to provide an enriched intellectual environment for MIT faculty and students. More than 160

faculty, researchers, and staff work with some 80 sponsors to define and resolve industry concerns and public policy issues.

Center research focuses on contemporary industrial problems – such as how to build safe, affordable, and environmentally friendly automobiles – that span social, natural, and technological interests. Research impact includes industry-wide changes prompted by the International Motor Vehicle Program's (IMVP) groundbreaking book, *The Machine That Changed the World*, and critical benchmarking studies. The Lean Aerospace Initiative, founded in 1993 to bring *Machine's* insights to a new industry, captured their decade of research in a 2002 book titled *Lean Enterprise Value: Insights from MIT's Lean Aerospace Initiative*. This year, ITC leaders, who spearheaded a national review of U.S. deployment practices published in 2002 as *Broadband: Bringing Home the Bits*, are sharing global lessons on the impact of high speed Internet access.

Some center programs like IMVP, a global research network currently hosting a Sloan Industry Fellow at MIT, have operated for decades. New efforts, such as the MIT Information Quality program (MIT IQ) are just getting started. MIT IQ, founded last fall to study information practices and find ways to make information more reliable, began Information Quality certificate training workshops in May.

CTPID Program Profiles

Cooperative Mobility Program: CMP is an international research program, headed by Associate Dean for Engineering Systems Daniel Roos,

to support sustainable, multi-modal transportation systems that will provide the mobility necessary to foster global economic development. CMP research was a core component of the World Business Council for Sustainable Development-commissioned report, *Mobility 2000*. *More information:* <<http://esd.mit.edu/ctpid/cmp/cmp-home.htm>>.

Ford-MIT Alliance: CTPID researchers are among the leaders of the Institute-wide Alliance, which is financially administered by CTPID. Alliance Co-Executive Directors Kristin and Steven Schondorf recently addressed industry issues at a CTPID community lunch. CTPID Senior Research Scientist Daniel Whitney is Ford-MIT Alliance program area manager for Product Development Process Technology. *More information:* <<http://ford-mit.mit.edu/>>.

International Motor Vehicle Program: IMVP's fourth phase, *Navigating Auto's Next Economy*, launched in 2001. This new phase integrates IMVP's strong research capabilities on the extended enterprise with new factors such as globalization, rising customer demands, value chain realignments, and environmental and sustainability challenges. PI Matthias Holweg, one of five recipients of an Alfred P. Sloan Industry Centers Fellowship, is expanding his U.K. build-to-order research to the U.S. and Japan and co-authoring a book on lessons from IMVP's ongoing Global Assembly Plant Study. *More information:* <<http://imvp.mit.edu/>>.

Lean Aerospace Initiative: LAI, founded in 1993, has served as a neutral forum for aerospace businesses

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from prime contractors to suppliers; for researchers in the U.S., U.K., and Sweden; and for the Air Force, NASA, and other governmental organizations. LAI's first decade produced strategic frameworks and tools, a book, and an online course developed with the Defense Acquisition University. LAI's Enterprise Value Phase, begun in 2002, launched Lean Now!, a new government-led initiative that supports and accelerates the lean transformation of government and industry value streams and interface processes. *More information:* <<http://lean.mit.edu/>>.

Labor Aerospace Research Agenda: Research on the aerospace workforce has taken on increased urgency, says LARA Co-Director Joel Cutcher-Gershenfeld, given disruptions in the civil aviation sector since Sept. 11 and complex shifts in military aerospace. LARA research was a core component of the Presidential Commission's *Final Report of the Commission on the Future of the United States Aerospace Industry*. With Co-Director Thomas Kochan, the LARA team is developing case studies and Web-based teaching tools. *More information:* <<http://web.mit.edu/ctpid/lara/>>.

Lean Sustainment Initiative: LSI, an Air Force-industry-academia partnership established in 1997, aims to streamline the Air Force's \$5.3 billion maintenance, repair, and overhaul operations. In case studies and by identifying best practices, LSI has targeted areas where data coding and communication problems have prevented accurate forecasting of parts needs. LSI developed a joint approach to problems that face both the government and industry maintenance services suppliers. *More information:* <<http://www.leansustainment.org/>>.

Material Systems Laboratory: MSL, established 20 years ago, develops strategies and methods to determine how new materials and related technologies will work within a larger system or application. Projects in the aerospace and automotive industries examine material selection in light of policy, economic, and environmental consequences. MSL Director Richard Roth is leading research on the relative costs and efficiencies of producing lighter cars. *More information:* <<http://msl1.mit.edu/msl/index.shtml>>.

MIT Information Quality: MIT IQ Director Richard Wang is expanding the focus of the Total Data Quality Program he co-directs with Stuart Madnick. The new program based at CTPID will focus on developing an Information Quality Filtering System, managing information as a product, creating a certification curriculum comparable to CPA training, and applying information quality to areas such as lean enterprise and corporate householding. With support from the U.S. Navy and industry partners, CTPID is offering the first certificate courses May 19-23 and August 11-15. *More information:* <<http://web.mit.edu/tdqm/www/>>.

Program on Internet and Telecom Convergence: ITC is MIT's only research program focused on furthering the Internet's evolution into a critical, global communications infrastructure. Directed by LCS's Dr. David Clark, program research examines uncertainties in the Internet's evolution in three areas: user devices, network access, and global backbone transport. Recent research has focused on broadband deployment, collaborative computing,

wireless futures, and the development of a Communications Value Chain Roadmap. ITC is a core contributor of Internet economic and policy analysis to the Center for eBusiness and the new Communications Futures program. *More information:* <<http://itc.mit.edu/>>.

Program on Science, Technology, and Environmental Policy: Co-Directors Professor Thomas Eagar and Dr. Joanne Kauffman are developing a research program to build critical knowledge to aid private and government decision makers, to understand regulatory impacts on industry, to propose alternative regulatory approaches, and to educate leaders to shape the future of environmental protection. *More information:* <<http://p-step.mit.edu/>>.

Technology and Law Program: T&L offers a cluster of graduate-level subjects associated with the Technology and Policy Program as well as research opportunities at the interface of law and technology. Professor Nicholas A. Ashford directs research that includes the design and evaluation of policies intended to encourage technological change that will help prevent chemical accidents and pollution; promote environmental justice by involving communities in governmental and corporate decisions; and investigate sustainability, trade, and the environment. *More information:* <<http://web.mit.edu/ctpid/www/tl>>.

Visit CTPID's Website for more information: <<http://web.mit.edu/ctpid/www/>>. To receive CTPID's newsletter, Impact, please e-mail ctpidcom@mit.edu. ❖

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The Singapore-MIT Alliance

Anthony Patera and Steven Lerman

The Singapore-MIT Alliance (SMA) is a partnership among MIT, the National University of Singapore (NUS), and the Nanyang Technological University (NTU). The first five years of SMA, denoted SMA-1, will soon conclude; the second five-year stage, SMA-2, will commence in 2005. In this article we discuss the current SMA program and the plans for the second phase.

A Snapshot of SMA-1

SMA-1 (and SMA-2) is funded by the Singapore Ministry of Education, by NUS and NTU, and by the Singapore Ministry of Trade and Industry through the Economic Development Board and the Agency for Science, Technology, and Research (A*STAR).

SMA-1 comprises five academic programs:

- Advanced Materials for Micro- and Nano- Systems (AMMNS);
- High Performance Computation for Engineered Systems (HPCES);
- Innovation in Manufacturing Systems and Technology (IMST);
- Molecular Engineering of Biological and Chemical Systems (MEBCS);
- Computer Science (CS).

SMA-1 students receive degrees from NUS or NTU, and certificates from SMA. A typical program has at any given time 35 professional Masters students, and on average five Ph.D students.

The SMA students, 459 to date, come primarily from Australia, China, India, Indonesia, Malaysia, the Philippines, Singapore, and Vietnam. China and Singapore account for 39% and 28% of the SMA students, respectively.

The SMA professional Masters students spend 2-3 weeks at MIT when they first enter the program;

subsequently they reside at NUS or (for IMST) at NTU. Most of the SMA professional Masters courses are taught synchronously from MIT by MIT faculty via high quality videoconferencing. In addition, a few courses and project classes are taught wholly or partially by Singapore faculty in Singapore. SMA Ph.D students spend an additional semester at MIT as tuition-paying Special Students who take regular MIT graduate courses.

The process of teaching synchronously and interactively via point-to-point videoconferencing is known colloquially within SMA as “beaming.” The beamed sessions are held in the 7 a.m.–10 a.m. and 7 p.m.–10 p.m. time slots, periods during which both MIT and Singaporean participants should arguably be awake. In a typical day, SMA beams 3 or 4 classes each morning and each evening.

The SMA videoconference technology supports two-way audio and video. Visual materials are sent through shared applications, electronic whiteboards, and document cameras; the necessary bandwidth is provided by Internet-2. Synchronous interactions are complemented by asynchronous technology. For example, all beamed class sessions are digitized and posted to the SMA Website within 24 hours of delivery.

About 45 MIT faculty from across the Institute are involved in SMA (roughly the same number of NUS/NTU faculty participate in SMA from the Singapore side). Roughly three-quarters of the MIT faculty participants are “SMA Fellows”; the remainder are “SMA Associates” – a slightly lower level of commitment. In addition to the distance interactions, most Fellows spend from two-to-four weeks each

year in Singapore. Most of the Fellows will also spend one extended-stay period in Singapore, typically between eight weeks and a full semester in duration.

The Objectives of SMA

From the MIT perspective, the main objectives of SMA-1, and to a certain extent SMA-2, are to:

- create new graduate subjects and curricula;
- develop new and innovative research programs;
- contribute, through activities and endowment, to MIT’s strength in certain strategic areas;
- establish a greater MIT connection in Asia, and, through this connection, bring new resources to MIT;
- permit MIT to experiment with a variety of different distance interaction technologies and modalities for both teaching and research;
- generate the necessary physical infrastructure and human resources upon which to build a permanent “distance presence”;
- identify the kinds of individual and institutional distance collaborations in both teaching and research consistent with MIT’s core values and aspirations.

Furthermore, SMA is informed by a vision of how distance interaction technology might transform MIT (see Page 26). There is a hope that SMA will be not only a strategic vehicle by which to explore a distance presence, but also a pillar of a permanent MIT distance presence. However, all parties know that any long-term commitment depends critically on success in the shorter term – and success as defined by each of the participating institutions and their respective objectives.

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Some Successes (We Think) of SMA-1

We believe that, even in the short period that SMA-1 has been in existence, there have been several benefits to MIT.

1. SMA-1 funds are responsible for the development and maintenance of many new distance-enabled classrooms that are now available to the entire MIT community.

2. SMA-1 has co-sponsored and/or served as a beta test site for many software and hardware developments that are now generally available to MIT faculty and students across the Institute.

3. SMA-1 has stimulated interdisciplinary curriculum development and research activities within MIT: several SMA-1 programs involve four departments/schools.

4. Several of the SMA-1 programs have introduced new MIT courses that are now open to all at MIT. In addition, SMA funds roughly 20 Teaching Assistants *at MIT* every year.

5. SMA-1 has enhanced the 25 SMA subjects that are also offered as MIT subjects to MIT students. Survey results indicate that most MIT students find these SMA-MIT courses, on balance, as good as – or better than – non-SMA MIT courses.

6. SMA-1 has sponsored 77 MIT graduate student visits to Singapore during the past four years.

7. SMA-1 has provided over \$30 million in research funds to 45 MIT faculty (SMA Fellows and Associates) over the past four years.

8. SMA-1 has brought faculty in several SMA-1 programs new resources. IMST benefits from Singapore's very dense technopolis; and AMMNS faculty have enjoyed access to A*STAR's Institute for Microelectronics semiconductor fabrication line.

9. SMA-1, at completion, will have financed five new endowed chairs in areas and departments related to the SMA-1 programmatic thrusts.

10. SMA-1 has sponsored many activities to bring "distance technology" to a broader cross-section of the MIT campus across all five schools.

Does Distance Education Work (in SMA-1)?

One of the key questions is whether distance education (SMA-style) really works. We address this here primarily in the context of coursework, since research interactions perforce take longer to develop.

Our assessment of this question is largely through circumstantial evidence. First, good students find the SMA programs very attractive. The average GRE scores for the incoming SMA class of 2002 is 2159, certainly commensurate with the scores of MIT students in participating departments. SMA selectivity is also very high – only 16% of those who apply are admitted; and SMA yield is very high – over 62% of those admitted choose to enroll in SMA programs. Second, once in the SMA programs, SMA students do as well in MIT classes as their residential MIT counterparts; the statistical evidence is unambiguous.

We can not, however, read too much into these results. First, most students who have been part of both MIT (classes) at a distance and MIT (classes and other activities) on campus clearly prefer the on-campus experience. Second, most MIT faculty still find it easier to interact with students in the classroom (and beyond) in the old-fashioned way. Third, the communications technology can be, on occasion, intrusive, not only to the distance students, but also to those participating in SMA-MIT classes on

the MIT campus. And fourth, for doctoral-level research, preliminary evidence confirms that considerable face-to-face interactions are a prerequisite for subsequent successful faculty-student mentorship relationships.

However, on balance, we believe that the SMA-1 evidence supports the premise that parts of an MIT education can be gainfully pursued at a distance.

SMA-1 Issues and SMA-2 "Remedies"

SMA-2 should improve upon SMA-1. We focus here on two key challenges for SMA-2: alignment of mission, and collaborative research.

One associated hidden (or not so hidden) aspect of SMA-1 is the opportunity cost of the diversion of MIT faculty from other MIT activities. There are many possible manifestations: a faculty member may be teaching non-MIT SMA courses and students rather than our own MIT courses and students; a faculty member may be supervising non-MIT students rather than our own MIT students; or a faculty member may be in Singapore, and hence less available for on-campus students and colleagues.

This problem was identified early on in SMA-1, and partial corrections have been in place for some time. For example, we have strongly encouraged all programs to align their subjects with existing or new MIT subject offerings. At present, of the 34 SMA-1 subjects in which MIT faculty are involved, 75% are also cross-listed MIT courses with "local" MIT students in attendance.

Further measures will be instituted within SMA-2. For example, in SMA-2, the extended-stay requirement has been eliminated. SMA-2 will still require face-to-face research inter-

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A Vision for an MIT Global Presence

Advances in communication technology are opening up new possibilities in distance interaction that promise to transform the elite research university from a community of common location to a community of common interests. This transformation into a truly global university will fundamentally change the academic landscape, providing faculty, students, and industry with many new opportunities. The traditional enterprises of the elite research university will not change; but teaching and research will now be conducted in an environment much less constrained by physical co-location.

A global MIT will remain first a residential “MIT” and only second will be a “global” MIT. The new information and communications technology will serve to define a distance presence consistent with MIT’s longstanding institutional values. Based on the discussions within the MIT Council on Educational Technology, there appears to be little interest from, and benefit to, MIT in becoming a provider of commodity “educational products” to large numbers of students. Rather, MIT should continue to provide highly interactive

offerings for the few and the best – which is the current “extended” MIT community of MIT students and alumni, MIT faculty and collaborators, and MIT industrial and institutional partners. In the same way that OpenCourseWare can be viewed as a modern version of the MIT-authored textbook, so can the global university be viewed as a modern version of MIT teaching and research. By removing geographical limitations, MIT should have even better access to the most talented students and academic collaborators worldwide.

The global university will permit MIT faculty to: (1) jointly develop and teach courses and curricula with faculty at other universities, (2) more effectively conduct research with peers at other institutions, and (3) more closely interact with our industrial partners. We describe the first two of these opportunities in greater detail.

(1) Many faculty have common pedagogical interests with colleagues at peer institutions. Typically, these scholarly collaborations focus on a particular subject area, with each faculty member providing complementary expertise. At present, faculty can pursue this common passion only in jointly-authored books. In the future, faculty from different institutions around the world will be able to combine forces

much more effectively, in jointly-taught courses simultaneously offered to students at both home institutions. High-bandwidth video-conferencing, application-sharing, electronic whiteboards, and telecontrol of remote experiments will provide the necessary synchronous environment.

(2) Similarly, most faculty also have long-standing and ongoing research collaborations with colleagues at other institutions in the U.S. and abroad. Regular multi-institution group meetings will represent a major improvement in research efficacy. Yearly meetings currently requiring air travel can be supplemented by much more frequent exchanges enabled by distance interaction technology. Furthermore, not only the faculty, but also graduate students and research staff can now actively participate in such collaborations.

These distance-collaborative efforts will be effected both at the individual level – smaller efforts conceived and initiated by individual faculty or units at different universities; and at the “alliance” level – larger (and fewer) efforts conceived and organized at the institutional level.

actions, but at a reduced scale: collaborating faculty will now meet face-to-face four weeks/year, typically two weeks in Singapore and two weeks here at MIT.

However, MIT is about MIT students, and any activity in which MIT students do not play a central role will remain marginalized. To remedy this situation, in SMA-2, we will offer dual, or “double” – *not* joint – Masters degrees. (Dual Ph.D degrees are not precluded, but also not anticipated in the shorter term; in most SMA-2 programs, the Ph.D will remain of the SMA-1 “SMA certificate” variety.) In a

dual degree program, the student will receive two degrees: a degree from MIT, and a degree from NUS or NTU. The student must satisfy the admission and degree requirements at each University as defined and approved by the respective faculties in accordance with standard institutional policies and procedures. In short, the dual degree student is no longer an SMA student; he or she is a full MIT student, as well as an NUS/NTU student.

This dual degree student will receive financial support through a Singapore-sponsored and Singapore-

administered SMA Graduate Fellowship. Students must be admitted by both MIT and NUS/NTU separately in order to be eligible for consideration for SMA Graduate Fellowships. Just as in many other fellowships held by MIT students, the SMA Graduate Fellowship will impose several short-term residency and/or service conditions that the student must satisfy if the loan is to be forgiven. However, unlike most fellowships at MIT, the SMA Graduate Fellows will be asked to spend considerable time during their fellowship period

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Patera and Lerman, from preceding page

in Singapore rather than at MIT. While in Singapore, the students will still take MIT courses with residential MIT students via distance education technologies.

Of course, there are very many, very real dangers associated with these proposed dual degrees. Will MIT degrees offered as part of SMA be exempt from some of the usual MIT requirements in recognition of the “dual” or “double” component? Will the sponsor expect that a certain number of students “put forward” every year for SMA Fellowships will automatically be accepted into MIT degree programs? Will our partners expect that NUS or NTU faculty shall automatically participate in teaching certain MIT courses? The answer in all cases is no. To safeguard what all faculty consider the MIT core values, *we will require that all aspects of SMA-2 honor all the standard MIT rules and regulations.*

First, the MIT degree associated with the double degree must either be an

existing MIT degree, or a new degree approved by all the usual MIT processes; we expect that most will be of the former variety. The degree must satisfy all MIT requirements, including our one-semester residency requirement for a Masters degree. Second, admissions must be done by MIT departmental committees as currently practiced; potential SMA Fellowships should not bias the proceedings any more than any other potential source of funding. And third, any NUS or NTU faculty participating in activities for our SMA students must obtain Visiting Professor or Visiting Research Scientist positions at MIT through the usual departmental channels. This is in the long-term best interests of both MIT and our Singaporean partners.

We turn now to research collaboration. There have already been several collaborative research successes in SMA-1, but we can do better. The primary impediment to research collaboration in SMA-1 has been the difficulty in establishing faculty-to-

faculty – or more generally, peer-to-peer – links where none have existed before.

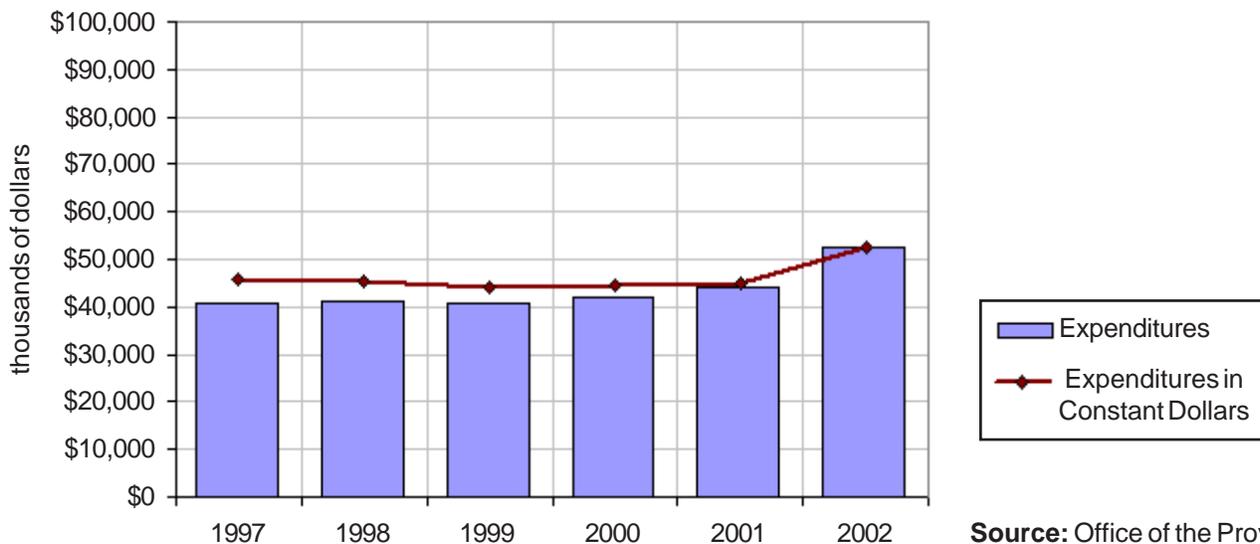
First, the SMA-2 areas of interest are both more numerous and of greater breadth than in SMA-1, and thus the pool of potential collaborators is much larger. Second, the SMA-2 selection process will strongly weight commitment to, and track record for, strong collaboration. Third, in SMA-2, different faculty can be involved in teaching and research even within a single program. We can thus focus on research quality and common interests, rather than solely on curricular compatibility. Fourth, the SMA-2 *open competition* for new academic programs should be able to identify the very best opportunities. Fifth, and finally, in SMA-2 there will be special provisions for shared post-doctoral fellows who will hopefully form a bridge between MIT and Singapore research groups.♣

[Anthony Patera can be reached at patera@mit.edu; Steven Lerman can be reached at lerman@mit.edu]



M.I.T. Numbers

**Research Expenditures on Campus
National Science Foundation**



Source: Office of the Provost

MIT's Video-On-Demand Website: *MIT World*

Richard C. Larson and Laurie Everett

M*IT World* <<http://web.mit.edu/mitworld>> was born at the Center for Advanced Educational Services (CAES) two years ago, after three years of planning and development work. The motivation was simple: public seminars and lectures comprise an important part of the richness of a campus-based university experience. Yet too few of us, even on campus (!), can see these lectures live—due to scheduling constraints for those on campus and due to travel and logistical constraints for others. MIT alumni in particular were asking for some meaningful way to “stay connected” to MIT. With the growing acceptance of the Web as a means for informing, at CAES we started a process of examining how we could get the best of MIT’s public lectures and seminars onto the Web. Finally, with the support of the MIT Alumni Association, the Industrial Liaison Program, the Provost’s Office, and the Lord Foundation of Massachusetts, *MIT World* is a reality. If you haven’t visited *MIT World*, try it, you’ll like it!

MIT World is a free, open streaming media Website of the most significant public events at MIT. It features the most recent speakers and guests from across the campus and around the world. By tailoring the content selection to the “scientific attentive” and the “thinking public” it has grown to reflect a great deal about MIT and the world of ideas that are generated, discussed, and analyzed every day on campus. Ironically, it also has captured a body of work that reflects the post-9/11 realities that affect our world, and will perhaps have historical significance to future generations. It is fast becoming an essential intellectual offering, central to MIT’s mission, with a total (as of March 31, 2003) of *111 videos*, growing at a rate of six to eight new videos per month. We are aware of no other comparable university-based service.

To sample the rich content of *MIT World*, simply go to the Website and make

sure you have the REAL Player™ downloaded on your computer’s hard drive. Then, selecting and viewing is simply “point and click.” If we are stretched for time, one of our favorite ways to experience *MIT World* is simply to *listen* to the streaming lecture while doing e-mail or some other computer-based task.

Scope

The videos on *MIT World* come from *more than 33 individual sources* at MIT, representing all five schools, and a wide range of labs, departments, centers, and programs. The site currently features 12 Nobel Laureates – Robert Horvitz, Wolfgang Ketterle, Kofi Annan, Franco Modigliani, Paul A. Samuelson, Robert M. Solow, Charles Townes, David Baltimore, John Hume, Seamus Heaney, Mario Molina, and Eric Chivian.

The speakers on *MIT World* represent a broad range of academic disciplines. Physicists (Wolfgang Ketterle, Walter Lewin) are featured along with biologists (Eric Lander), bio-engineers (Robert Langer), economists (Lester Thurow, Olivier Blanchard), the CEOs of major U.S. companies (Lou Gerstner of IBM, Carly Fiorina of Hewlett-Packard, Henri Temeer of Genzyme, Michael Dell of Dell Computers, Jeff Bezos of Amazon.com), experts in current world affairs (Kofi Annan, Scott Ritter, Lewis Branscomb), writers (Stephen Pinker, Anita Desai, Sylvia Nasar), poets (Seamus Heaney), and inventors (Doug Engelbart, Steve Wozniak, Raymond Kurzweil).

Audience Growth

Without much “marketing,” the number of visitors to the *MIT World* Website has grown significantly over the past year. From March 2002 to March 2003:

- The number of videos streamed has increased from 1,937 per month to 7,345 per month, an increase of 379%.
- Visits to the site have grown from 3,318 to 7,806 per month, an increase of 234%.

- New visitors have grown from 2,074 to 5,322 per month, an increase of 257%.
 - Page hits have grown from 9,753 to 21,516 per month, an increase of 220%.
- Other audience information:
- 35% of traffic is from other dot.edu sites.
 - 20% of traffic is from Fortune 1000 companies.
 - 65% of the videos streamed are at the high 220k broadband rate.
 - 30% of the traffic is from outside of the U.S.

Integration/Communication

MIT World is a regular part of several high profile communications and outreach efforts at MIT including:

- The Alumni Association’s *Tech Connection*, mailed to 60,000 alumni monthly, features a specific *MIT World* video in each edition.
- A periodic MIT Home Page Spotlight, such as the one featuring ACM/IEEE-sponsored Jeff Bezos’ appearance in March 2003, quadrupled traffic on *MIT World*.
- Links from the home pages of Schools and Centers (School of Engineering, Sloan School of Management) include high level features or mentions on the Dean’s pages.
- *Technology Review* and *MIT Technology Insider* – videos regularly mentioned in print, linked to from MIT Technology Insider.
- News Office – *News Digest*, listed as a resource for editors.

Mail/Feedback

MIT World has received approximately 1,500 requests to be added to the e-mail list serve. Alumni and other visitors regularly offer general comments about their viewing preferences. 30% of the mail comes from self-identified alumni. The mailing list has grown from 250 in May 2002 to more than 1,500 today.

(Continued on next page)

MIT's Video-On-Demand**Website: MIT World***Larson and Everett, from preceding page***Constituents/Internal**

MIT World is uniquely positioned to serve a wide range of constituents. First, the producers of the events themselves are served by dramatically increasing the reach of each event, so that more people are able to view it. The lecture remains readily available in the archive. For example, the MIT Libraries and MIT Press Bookstore spent \$600 to videotape the Steven Pinker *authors@MIT* event. In 14 weeks, that lecture has been seen more than 3,000 times. From the point of view of the sponsoring organization, that's a "cost per viewer" of only 20 cents. Adding typical speaker's cost of travel and lodging to that of videotaping, without the multiplying effect of *MIT World*, a typical seminar at MIT costs in the range of \$20 to \$50 per live audience member who sees the lecture. Adding *MIT World* to the "content distribution model" can reduce the average cost per viewer to less than a dollar.

Audiences connected to MIT who are served include, but are not limited to: MIT Alumni, Industrial Liaison Program members, faculty, students, and staff at MIT (with particular value to those at Lincoln Lab), the Educational Council, MIT Parents Group, the Admissions Office, participants in MIT-related programs such as the Singapore-MIT Alliance, the Cambridge-MIT Alliance, and visitors to MIT's OpenCourseWare Website.

Constituents/External

MIT World is fast becoming required or recommended viewing at other institutions. E-mail from staff at Honeywell indicates that Honeywell Corporation has placed *MIT World* on its employee intranet "technology learning site" under "free seminars." *MIT World's* Web stats service reveals four examples of other universities assigning *MIT World* lectures. These include: Washington University, University of Pittsburgh, University of Maryland, and Saginaw Valley State University.

MIT World is also a partner in the *WGBH Forum Network*. This forum, run by the nation's premier public broadcaster, hosts videos from educational and cultural institutions from the greater Boston area. *MIT World* has provided a small number of its videos to the *WGBH Forum Network* site. Visitors to WGBH's site are directed to *MIT World* to see more videos from MIT.

Beyond MIT and its alumni, the general public is a major audience. The intellectually curious public looks to MIT as a source for original ideas about a wide range of issues that affect the world today.

MIT World Gets a Facelift

Just as the MIT home page has recently been dramatically redesigned, so too is the ever-growing *MIT World* site undergoing major renovations—leading to a significant upgrade in capabilities and "friendliness." The new features will include:

- Improved overall identity and logo
- Information architecture redesign
- Database driver keyword and meta-data search
- Graphic/user interface redesign
- Improved optional user registration
- User connection speed preference
- Improved pop up surveys
- Customized "document not found page" to detect and notify of broken links.

These services will result in the following changes:

- Clearer, cleaner design – Reuse of current logo into a much cleaner environment.
- Video Finder – Present on all pages, a user friendly "finder" that will enable user to search by entering a key word (e.g., Iraq), search by MIT host/source (e.g., Industrial Liaison Program), or search by broad category (e.g., biotechnology).
- Database – The content will be housed in a centralized database, which will enable the search functions, as well as improved administrator use (see next section).

- Email to a friend – This feature will enable users to quickly and easily e-mail the Web page contents to a friend.

- Register – This feature will enable users to quickly and easily sign up for e-mail updates and be added to the *MIT World* mailing list, as well as provide feedback.

The new site is expected to go live in June 2003, after a period of testing. Look for it!

Conclusion

As the audience grows rapidly and the use of the videos steadily increases, the momentum behind *MIT World* is significant. Each video added to the site has its own constituency. While overall comments received about *MIT World* have been very positive, many users also draw conclusions about what this effort says about *MIT itself*. The site reflects the MIT identity well, and extends the message of "openness" on campus as well as around the world. The new Website's design takes into consideration the consistent feedback received from the audience, whose overriding requests are for more videos, and for smart tools to find them.

MIT World is uniquely positioned to provide an informal learning experience to an audience of lifelong learners, and build an open learning environment for those who are interested in the world of ideas generated at MIT.

Acknowledgements

In the production process, *MIT World* utilizes the excellent services of three MIT units: MIT Video Productions (MVP), Digital Technologies and Streaming Operations (DTSO) and MIT IS/Web Communications Services (WCS). The first two units are parts of AMPS, Academic Media Production Services.♣

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OpenCourseWare Update

Measuring Long-Term Success

Evaluation of OCW Depends on Articulation of Clear Goals

Kyung Han

When MIT OpenCourseWare was first announced in April 2001, the BBC came calling, President Vest and Hal Abelson suddenly became very familiar names to the readers of *The New York Times*, and the MIT News Office was deluged with e-mails from people all over the globe, excited about this bold educational initiative.

The announcement was a success.

When the first sample of courses opened to the public on September 30, 2002, MIT OCW received more than 13 million hits, the site did not crash, and the Institute once again garnered positive media coverage.

The MIT OCW pilot site was a success.

The sites developed for the first 50 MIT subjects in the pilot proved the concept, but measuring long-term success will not be so simple. There is no revenue model, so we will not judge success by profits. Visitors to the site cannot register for courses, so we can't benchmark the number of degrees or certificates we hand out. And it is a wholly new way of thinking about Web-enabled educational publishing, so we can't compare ourselves to similar initiatives. The ultimate evaluation of success will be whether we accomplish our dual mission: success in *what* we do – provide free, searchable, coherent access to all MIT course materials for educators, students, and individual learners around the world – and success in *how* we do it – creation of an efficient, standards-based model that adds value for the MIT faculty, and that other universities may emulate to publish their own course materials.

“Why would we do this?” President Charles M. Vest asked in April 2001.

“Because we see it as part of our mission: to help to raise the quality of higher education in every corner of the globe. This program is based on the twin values of opportunity and openness. These are values that have made our universities and our nation strong. They are values that will keep our world safe and strong.”

Although the vision for MIT OCW as stated by President Vest includes a major potential impact on an extremely broad audience, we must develop measurable goals. Just as importantly, these goals must be directly linked to MIT's mission as an institution. Now that the initial goals framework of *what* and *how* has been established, we are developing a set of sub-goals that support that framework and MIT's mission, and we are finding metrics that will measure our success.

Evaluation will also occur in stages: Short-term, we are focused on the publication of 500 courses in September, but long-term, we must plan for a way to measure MIT OCW's growth from the publication of 500 subjects, to the publication of nearly 2,000, virtually all of the subjects taught by MIT's faculty.

Evaluation of the *what* will address three areas:

- Access – How many people are using the material, how are people connecting to the materials, and how usable are the materials?
- Use – How are they using them?
- Impact – What difference does MIT OCW make for individual users, and in the world?

Measured success against three metrics will inform and influence the strategic direction of the project, and will provide input and data for incremental refinements to MIT OCW materials and services.

Measuring the *how* of the project depends on development of effective strategies in five areas:

- Publication and Production – Establish and execute an efficient, high-quality publication process;
- Organization – Build and sustain a responsive, professional organization;
- Technology – Create an effective technology infrastructure;
- Planning and Evaluation – Measure use, evaluate impact of MIT OCW and factor findings into future plans, and;
- Communications – Disseminate information about MIT OCW and capture of feedback.

The initial version of the plan has been analyzed by a team of external experts, including John Seely Brown, the chief scientist of the Xerox Corporation; James Spohrer, a distinguished scientist at Apple Computer best known for his work in the areas of authoring tools and online learning communities; and Albert Koers, the executive director of the InterAcademy Council. Here at MIT, the goals and evaluation plan will also be scrutinized by the MIT OCW Faculty Advisory Committee, chaired by MIT Professor Steve Lerman.

As the evaluation and measurement of MIT OCW continue to evolve, and we begin to develop hard data that demonstrates the impact of this initiative, we will share them with the MIT faculty in this space.

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

[Kyung Han can be reached at kyinhan@mit.edu]

Letters**Some Reflections on the Issue of Housing at MIT**

To The Faculty Newsletter:

As I sit here on the commuter rail on my morning commute (75 minutes door to door each way from Acton, MA!) I read in detail the current edition of the *Faculty Newsletter* (February/March 2003) and I just wanted to let you all know that I found the articles in it on subsidized housing interesting and thought-provoking.

I would strongly urge you to follow through with the suggestions being raised in the articles by Bob Brown and Bob Redwine (though given the historical context raised by Bob Simha I cannot help but feel a certain amount of *deja vu*...what a lot of missed opportunities!).

A few points I would like to add to the discussion:

As a former junior faculty member at Harvard I cannot help but reiterate the *multiple* levels of support offered to their junior faculty (including (a) rental subsidies on Harvard area apartments, (b) Harvard real-estate-owned condos/townhouses, (c) second mortgages). I made use of both (a) and (c) during my 6 years there, and as I look back and count, I realize that *every* junior faculty member I knew made use of one of these 3 options.

Everyone's circumstances are somewhat different: offering the breadth of choices above is key in accommodating as many people as possible. [There was even a fourth option – related to (a): we lived in an apartment in mixed-use housing. The first 4 floors were student accommodation and the top 2 were faculty only. How easy would this have been to realize in the Warehouse or the new Sidney-Pacific dorm? Even though there were no formal duties required, it was inevitable that you interacted with students who were neighbors and it certainly fostered a sense of community.]

The idea of *immediately* exploiting 100 Memorial Drive seems a “no-brainer.” The location is ideal and the lease terms of “first refusal” for new rentals is perfect. The costs are relatively small and should indeed be considered part of the cost of competing/doing business (isn't it worth all the free press of that #1 *U.S. News & World Report*

ranking?). As to the size of subsidies: Harvard used a sliding scale which worked well: with larger subsidies for more expensive/larger units (i.e., from 1 to 2 to 3 bedrooms as family size [and typically age, salary] grow).

As a corollary, let me suggest that empty nesters may also be tempted back to such a location (I personally am in the school-age years...which we wish to spend in suburbia) but my wife and I already are thinking about moving back to the city when we become empty-nesters...(as eloquently discussed in Steve and Lori Lerman's article in the same issue of the *FNL*). With my current commute, every offer of “finger food with the faculty” or dinner with students at a fraternity or chatting about graduate opportunities with the Society of Women Engineers/ASME chapter must be weighed against actually getting home to see my kids before they are in bed. These days will pass and it would be wonderful to live close to campus and in the metro area again. Senior faculty salaries are of course higher and so subsidies wouldn't be necessary (or perhaps there would be a prorated subsidy based on relative salary of junior/senior faculty). I am sure a number of senior faculty might be interested in such an option.

If one takes the long view (i.e., the 50-100 year view which Harvard typically does) then these programs don't even really have to be a loss-making proposition; just a different use of some of the endowment capital. Harvard Real Estate (HRE) is a stand-alone profit-making venture through which the townhomes/condos/apartment buildings for faculty/staff are rented/leased/bought. Harvard takes the view that any land it buys within 1 square mile of the Yard will be worth more in the future than it is now, whatever the price, and bids accordingly. I am sure the MIT Endowment already has substantial REIT or other real estate investments in the Boston/Cambridge area. The land continues to appreciate without any upper bound...why not encourage/force it to make new investments in developments that will be available to faculty/staff (either exclusively or preferentially). Even if the profits from lease income are lower than “market,” this will not be a loss-making activity...they will inevitably appreciate over the years. This approach could be used to perhaps fund some new townhome/condo developments

for purchase in the Cambridge area, rather than just the leasing option of 100 Memorial Drive.

I understand that a few years ago the option to purchase 100 Memorial Drive outright arose and we declined...let's not make similar short-term decisions in the future.

Although not directly related to housing of MIT faculty, if the institutional commitment is made to develop the modest infrastructure needed to administer such a program, then I would encourage us to leverage the effort to address another important concern: the possibility of providing visiting faculty short-term housing: I have a good colleague on sabbatical at Princeton this year living in a furnished apartment by a lake on campus in their faculty housing development. Many other universities offer similar programs...we don't!

The traditional MIT mindset of “we don't have to do that, people will come anyway” may have been good enough in the past, but we can do better, surely! Again this doesn't have to be a loss-making proposition – the costs can be recovered from the visiting faculty (or the hosting department). All it needs is for someone (the Provost's Office?) to assume a long-term lease on several of the 100 Memorial Drive units, furnish them (there are companies that can do this on purchase/rental/lease basis) and then rent them out to visiting faculty (at competitive rates...this may be the stumbling block I suppose – of course if we owned the building the rate would be decidedly lower!). Typical rental periods may be 1, 3, or 6 month increments. If this model is feasible, it can be scaled infinitely (depending on demand) from 1 to N units. This would allow us to attract many visiting faculty (some of whom we may even be trying to woo or recruit to MIT!). It would also serve needs associated with visiting faculty in programs such as CMI, SMA, etc.

To echo the concluding words of Bob Brown's article, I hope we get to hear more in the fall about new initiatives in the area.

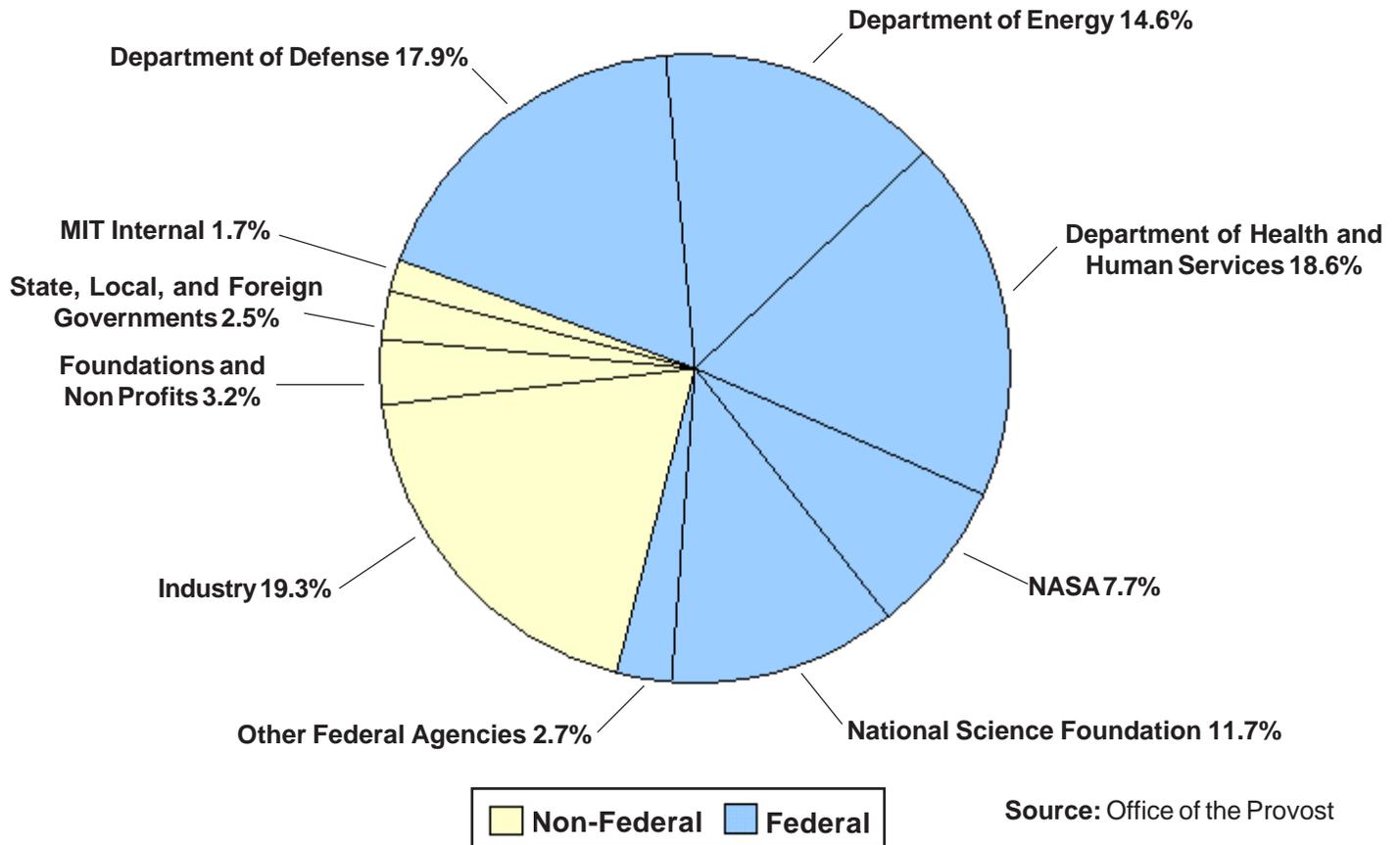
Sorry for the length of this e-mail (if only the train ride were shorter!).

Best regards,

Gareth McKinley
Professor of Mechanical Engineering

M.I.T. Numbers

Research Expenditures on Campus Percent of Total by Major Sponsor FY2002



Campus Research Expenditures in thousands of dollars

Department of Defense	80,377
Department of Energy	65,455
Department of Health and Human Services	83,517
NASA	34,326
National Science Foundation	52,612
Other Federal Agencies	12,143
Total Federal	\$328,430
Industry	86,389
Foundations and Non Profits	14,428
State, Local, and Foreign Governments	11,165
MIT Internal	7,476
Grand Total	\$447,889