

MIT Faculty Newsletter

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

this issue features Faculty Chair Steven Lerman on “Is the Unity of the Faculty Still Relevant?” (page 4); our MIT Profiles, highlighting MIT Corporation Chairman Dana G. Mead (page 6); and MIT Poetry, offering “Eighteen years old, October eleventh,” by Joe Haldeman (page 13).

Ed. Note: Letters concerning the case of MIT Professor James L. Sherley can be found on our Website: web.mit.edu/fnl.



Sixty-six Years of Sponsored Research

Claude R. Canizares

A FEW YEARS AGO, MIT’s total sponsored research volume first crossed the \$1 billion mark. For FY2006, research expenditures on campus totaled \$587.5 million, while research expenditures at Lincoln Laboratory for the same period were \$636 million, for a total of \$1.2 billion. (Not included in these numbers are expenditures for research conducted by MIT faculty at Whitehead Institute, Woods Hole Oceanographic Institute, the National Bureau of Economic Research, or research funded by Howard Hughes Medical Institute.) In FY2006, Campus and Lincoln Laboratory research revenues made up almost 57% of MIT’s total operating revenues. To put this in perspective, in FY1957 MIT’s total research expenditures of \$54 million represented 72% of MIT’s \$75.2 million total operating expenditures.

This article presents some long-term trends in sponsored research funding and a few of the more recent challenges.

Sponsored Research Historically

M.I.T. Numbers (back page) records the changes in total MIT sponsored research over the past 66 years, in both real and inflation corrected dollars (the correction relies on the federal con-

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Editorial Human Engineering and the Energy Crisis

MIT IS AT THE EPICENTER of future energy technology research excellence. There is much vigor in our collective pursuit of technological solutions to our nation’s energy problems, and the future looks brighter because of it. Every week we read in journals, the popular press, and local MIT publications of innovative energy engineering and science done by our colleagues and students. The MIT Energy Research Council site provides a focal point, web.mit.edu/erc/.

A large research portfolio is in place, spanning a wide range – from basic science to immediately applicable technologies. Research directed towards life-cycle analyses of technologies, for instance of catalysts for solar-fueled water splitting, biofuels, and the automobile, are examples. Such research provides important information for policy makers in Washington and for corporate decision makers as well. Educational and student-generated initiatives are also in evidence on campus. And all of this is to the collective good.

But the energy “problem” is as much about culture, social perspective, the will to change our societal energy behavior, and politics as it is about science and technology.

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Human Engineering and the Energy Crisis
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How does the “hard” research done here fit into this broader view of the energy problem? More precisely, what are we at MIT doing to accelerate our understanding of the cultural, social, and political dimensions of the country’s energy problems, with the aim of sparking productive changes in our collective behavior?

If we were to do a careful inventory of energy-related research at MIT (we ourselves have not), we would surely find groups that are addressing these other dimensions of the energy problem. There is work on management of regulatory regimes for nuclear power and electricity, and work on analyses of coal usage and its consequences. But here at MIT these efforts do not shine as brightly in our col-

lective public vision as does “hard” science and technology. They should.

For those of us old enough to recall sitting in line waiting an hour or more to get a tank of gasoline in the early 1970s, there is a reference point. A pervading sense of crisis stimulated the populace. Do we need to wait for a similar wake-up call? What would it take – worldwide rationing of electric power to ameliorate the drain placed on supply systems as the large-population Asian countries come fully on line?

The precise nature of the “problem” of inducing changes in our nation’s energy behavior that can pass muster in political and fiscal domains is not clear. The public media (*The Wall Street Journal*, *The New York Times*) frequently publish Op-Ed pieces that offer partial solutions. Who at MIT is bringing to bear an in-depth analytical treatment of these options?

A small example: Economists know that an aggressive increase in gasoline taxes – a “Patriot’s Tax” – will reduce medium- to longer-term demand for gasoline even if very short-term demand is inelastic. Are there clever political-economic tradeoffs that can be designed to sell such a tax to a reluctant public and an even more reluctant Congress? Who at MIT is working on such tactics?

Some might cite the Principle of Comparative Advantage: do what you do best and leave the rest to others! However, that is not really the spirit of MIT. If the governors of many states can galvanize their constituents to conserve energy, and can provide detailed blueprints to achieve this goal, cannot we and our leaders do as well? ■

Editorial Sub-Committee

letters

Delighted with School of Architecture and Planning

To The Faculty Newsletter:

HAVING JUST READ THE profile and heard from the Dean the moving parts of the SA+P, I am delighted [“MIT Profiles: Adèle Naudé Santos,” *MIT Faculty Newsletter*, Vol. XIX, No. 2]. When I was a student and before I graduated in 1961, I found the School a great place just to be in. My advisor Kevin Lynch and my Professor and mentor Charles Abrams gave me a much enlarged sense of urban form and urban political dynamics. The attitudes of the faculty from ideas of pure design – detached from specific problem solving – coming from my sculptor professor to the more pragmatic instructions on how to do city planning, reflected levels of honesty and sincerity that were

deeply comforting. When during one summer I did an internship in the Department of City Planning of San Francisco, where I assumed there would be the best thinking happening, I was horrified by the attitudes there and the lack of interest in thinking about what city planning was really for.

I feel as though SA+P has gone way beyond where it was in my days at MIT and it was great then. Since leaving MIT in 1961, I have gradually been shifting my functional areas from architecture into development, thence into real estate general brokerage. My dominating interest is in urban transportation planning, now underway in earnest after several abortive attempts by the City to galvanize around it. Honolulu is a laboratory of failure to

understand the idea of planning and to understand how to be a planning city. Having come here by accident and against my initial will, I have come to love it here and now five grandchildren later I am in a sense stuck – but in a better sense stuck than the word suggests. Honolulu is a marvelous mix. We have over 100,000 individual condominiums most of which seem priced beyond most of the young people growing into family sets that cannot afford them. That is not the best part of the mix. It is a general problem of most of our cities. I am excited by the ideas of SA+P and its – in a way – disparate groups coming together as a coordinating force. ■

With good wishes,
Rich Lowe

From The Faculty Chair

Is the Unity of the Faculty Still Relevant?

Steven Lerman

ONE OF THE MOST important notions in MIT's system of governance is the concept of the "unity of the faculty." This idea is the foundation for why we expect each faculty member to teach, do research, and provide service to the Institute and the larger community.

We all understand that the amount of time any of us spend on each of these activities in any one year will vary widely, and that some of us will do some things better than others. However, the unity of the faculty is the philosophical foundation for many of the decisions we make, including why we don't have faculty appointments that are purely for teaching or research, and why in tenure and promotion we value contributions to each of the three major areas of faculty work. It is also why decisions such as the determination of what should be in the undergraduate educational commons and individual departmental degree requirements require a vote of the entire faculty, not just approval of separate departments and schools.

The spirit of the unity of the faculty also encompasses the idea that faculty have a shared sense of mission for the entire university. Some have argued that we have become so specialized in our work that the idea of faculty unity has become antiquated and honored in words rather than in deeds. These skeptics see little evidence that the philosophy of the unity of the faculty is manifested in how MIT actually works, and they are sometimes cynical about the processes of faculty governance, in which the notion of a unified faculty should be most evident. I believe, however, that there are compelling counterexamples that make a con-

vincing case that the idea of our working as a single faculty towards important goals remains alive and well.

We all accept that, day-to-day, most of our efforts will be directed toward teaching, research, and service in our individual departments, labs and centers. This is where MIT's core strengths (and those of our peer universities) lie. The idea of the unity of the faculty doesn't mean that large numbers of us will spend all of our time working towards centrally-decided goals. However, to be useful, the notion of unity does involve some level of engagement by many of us in activities that transcend department, lab, and center boundaries. I offer two examples where the concept of faculty unity has manifested itself.

The Undergraduate Educational Commons

The first and most current example is the way in which many of us have become actively involved in the discussions about the recommendations of the Task Force on the Undergraduate Educational Commons. It is clear that faculty feel strongly about what goes into the undergraduate commons. Discussions about what every student should know before graduating are happening all over campus. The intensity of these discussions reflects just how important the common experience is to us. Some see this intensity as worrisome and are concerned that it may lead to divisions among us.

In perhaps a naïve way, I hold a completely contrarian view. For me, the intensity with which we are debating changes in degree requirements and other aspects of

the Task Force's recommendations is heartening. Whether we acknowledge it or not, at least when we're considering the MIT undergraduate program, the spirit of faculty unity is alive and well. The passionate debate over the issues that the Task Force has raised is a credit to MIT and a healthy repudiation to the commonly held idea that professors in research universities don't care about undergraduate education anymore. The fact that each of us feels empowered to be involved in the discussions about the entire undergraduate experience, rather than just our own department's degree programs reflects a sense of unity that, in my view, is healthy.

OpenCourseWare

My second example is how we as a faculty responded to the OpenCourseWare (OCW) initiative. The idea of MIT electronically publishing the materials we use in teaching virtually all of our courses represents the idea of the unity of the faculty at its best. It sometimes astonishes me that over 80% of the faculty, representing 1550 of the approximately 1800 courses with materials that might be openly published, have already participated in OpenCourseWare. Moreover, the goal of publishing the materials for the remainder of our courses should be achieved sometime in the next academic year.

The faculty's participation in OCW has been entirely voluntary. The vast majority of us have taken time from our crowded schedules to organize the materials in our courses and we have agreed to make them available to anyone, anywhere, for non-commercial uses. No other university has come even close to this achievement. I

would argue that the tradition of faculty unity is what made it possible for MIT to undertake OCW in the first place, and to succeed in getting the huge level of participation by the faculty once we committed ourselves to OCW's shared goals.

The success of OpenCourseWare also provides us with some important lessons about how to undertake MIT-wide initiatives that leverage the unity of the faculty. First, the idea of publishing all of the materials used to teach at MIT originated at the grass roots from a group of faculty who started with an important idea and worked tirelessly to engage their colleagues around MIT in moving that idea forward. We seem to be at our best when ideas come from the "bottom up."

Second, the goals of the initiative were widely shared, at the very beginning of the process. Before OCW was launched, a group of faculty went to every department to discuss the idea and find out whether

the underlying values associated with open publication of course content were broadly shared. Without this consensus around the overall mission, there was little prospect of broad participation.

Third, the leadership of OCW understood the pressures on faculty time. No matter how important an initiative is, it still must compete with all the contending demands on a busy faculty. For OCW to be successful, it had to work effectively with each contributing professor in a way that minimized the amount of time he or she needed to spend. Creating a support organization that is truly flexible and service oriented has been central to why faculty members have agreed to contribute their course materials. Most of the actual work of reformatting materials, obtaining rights clearances, and moving the materials through a complicated publication process, is done by the OCW staff, not by the individual faculty members. As

a result, most of us report that getting our course's materials on OCW has required about five hours or fewer of our own time.

The passionate interest in the definition of the undergraduate educational commons and the extraordinary level of participation in OCW suggest to me that the idea of the unity of the faculty is alive and well. We will continue to discuss, debate, disagree, and make decisions about many things that affect all of us. We will continue to commit our collective time and energy to things that go well beyond our departments' boundaries. These processes will often appear chaotic as we try to reach consensus about things we care about deeply. However, I vastly prefer this type of chaos to the placidity of indifference or the narrow focus on our own small spheres of direct interest. ■

Steven Lerman is Professor of Civil and Environmental Engineering; Faculty Chair (lerman@mit.edu).

Teaching this spring? You should know ... the faculty regulates examinations and assignments for all subjects.

Check the Web at web.mit.edu/faculty/termregs for the complete regulations.
Questions: Contact Faculty Chair Steve Lerman at x3-4277 or lerman@mit.edu.

No required classes, examinations, exercises, or assignments of any kind may be scheduled after the last regularly scheduled class in a subject, except for final examinations scheduled through the Schedules Office.

First and Third Week of the Term

By the end of the **first week** of classes, you must provide a clear and complete description of:

- required work, including the number and kinds of assignments;
- an approximate schedule of tests and due dates for major projects;
- whether or not there will be a final examination; and
- grading criteria.

By the end of the **third week**, you must provide a precise schedule of tests and major assignments.

For all Undergraduate Subjects, Tests Outside Scheduled Class Times:

- may begin no earlier than 7:30 P.M., when held in the evening;
- may not be held on Monday evenings;
- may not exceed two hours in length; and
- must be scheduled through the Schedules Office.

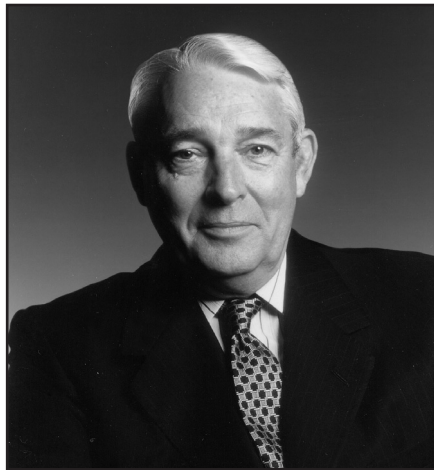
No Testing During the Last Week of Classes

Tests after Friday, May 11 must be scheduled in the Finals Period.

MIT Profiles

Dana G. Mead

The view from 30,000 feet



Dana G. Mead was named chairman of the Corporation of the Massachusetts Institute of Technology in July 2003. He has been a Corporation member since 1996, and has served on numerous committees. He received his doctorate in Political Science from MIT in 1967. Mead was chairman and chief executive officer of Tenneco Inc. from May of 1994 to November of 1999 when he retired. He serves on the Board of Directors of Pfizer Inc. (New York, NY) and Zurich Financial Services (Zurich, Switzerland).

The following interview of Dana Mead (DM) by the *Faculty Newsletter* (FNL) took place in two parts and was completed early this year.

FNL: *Perhaps the simplest thing to start off with is: What do you view as the major challenges facing the Institute in the coming year and maybe over the next five years?*

DM: First, you have to remember the perspective from which I look at things. I'm kind of looking at them from 30,000 feet, although I get exposed to a large number

of issues here. So looking at it from that standpoint there are a couple things I think that we really need to get done in the next year. One is President Hockfield has to finish getting her team on board. We need a new vice president for development; Barbara Stowe did a tremendous job but has retired. It's a very hard job to fill and we don't have a lot of time. [Ed. Note: As this article went to press it was announced that Jeffrey Newton will be MIT's new Vice President for Resource Development.] MIT has to generate between \$250 million - \$300 million annually to keep our heads above water and to continue our present level of research and educational activity. Then there's the newly created position of Executive Vice President for Finance and Treasurer – basically the CFO or VP of Finance. That's a critical one because that's where the budget is developed and also where the debt structure is managed. Sherwin Greenblatt has done a tremendous job on a short-term basis, and it's an absolutely critical job. In November it was announced that Theresa Stone would be MIT's next Executive Vice President and Treasurer. And we learned in December that Alison Alden had been hired as the next Vice President for Human Resources, and that R. Gregory Morgan would serve as MIT's general counsel, or chief counsel, our head lawyer.

FNL: *There's been some concern expressed about the idea of a chief counsel.*

DM: There has been a bit of reaction to that, the thinking being that somehow

we're going to get more legalistic and consequently more bureaucratic and less flexible. But that isn't the case at all. It's just that we've had a very, very talented, skilled group of lawyers at what you could call the first tier, who have successfully moved us through some difficult situations but we've never had someone in the counsel's job who basically was both the focal point of all of our legal activity, and who also could serve as a key advisor; and that's a vital part of this job, a senior advisor to the president. And I don't want to ignore the importance of the position of VP of Human Resources. From the operation of the Institute in support of our departments, laboratories, and faculty, having a good human resources operation is absolutely critical.

FNL: *Don't underestimate the faculty interest in that position. We remember the former VP of HR as the person who tried to close us down over Christmas and New Years, which did not show the greatest understanding of how MIT works.*

DM: So team building is a big challenge. That's on the president's plate and it's time consuming. One point here is very important, and that is that we're not going to settle for just anyone. We're out looking for the absolute top people to fill the jobs. Last spring we hired a CIO (now called the President of the Investment Management Company), Seth Alexander, who has proven to be a terrific hire. He's brought new insight, and he's brought a new set of perspectives to this whole business of investing. We've also simplified the

organization. There was always confusion because we had the treasury functions commingled with the investment functions. This was the result of having a highly talented person, Allan Bufferd, serving as both the CIO and the Treasurer.

FNL: *To what extent is the faculty viewed as being important to successful fundraising?*

DM: I would say it's a key part of the fundraising. . . . I think faculty, not just as individuals but in the broader substantive aspect of what they present, are absolutely key to raising money, because people want to see what their money is doing, and how it's going to contribute to the success of the Institute, of individual departments, and to science and the nation.

We spent a year-and-a-half pulling those apart, so the investment management company has one mission, to invest. The other functions are under the umbrella of the Executive Vice President for Finance and Treasurer.

FNL: *How important do you view the past experience these people may have had at academic institutions and their ability to function in our environment?*

DM: Understanding this is very important. In fact, if you had to arrange the selection criteria, it's probably number two as an important criterion. Number one is the capability of the individual, combined with a proven track record of achieving results. We need someone who understands that this is a unique environment. For example, we've had serious discussions about the difference in raising money for a research and educational institution vis-à-vis a not-for-profit of another kind or a foundation, to assure that our recruiting efforts for the development job would be informed and have sharp focus.

FNL: *To what extent is the faculty viewed as being important to successful fundraising?*

DM: I would say it's a key part of the fundraising. I've been involved in many MIT *On The Road* alumni meetings, which are really faculty shows. The faculty presentations are the core of those meetings. I've been to the

Industrial Liaison faculty presentations in Tokyo and I've been to Singapore with faculty. Without faculty, these meetings would not succeed. I think faculty, not just as individuals but in the broader substantive aspect of what they present, are absolutely key to raising money, because people want to see what their money is doing, and how it's going to contribute to the success of the Institute, of individual departments, and to science and the nation. The faculty working where the rubber meets the road are the ones who bring real credibility to the MIT story. But I'll tell you one place where I think the faculty could do more. The interaction of the faculty with the Visiting Committees is key to maintaining enthusiasm and commitment to the Institute among those who will directly and indirectly raise a lot of money for MIT. I think many of our departments, labs, and centers can do a better job of assuring that faculty interact across a broad range of activity with the Visiting Committees.

FNL: *How do you measure a good job?*

DM: One is just showing up and participating. For example, when the Visiting

Committee meets with tenured faculty and only three people show up in a department, that doesn't show much interest in what the Corporation's trying to do for that department or the Institute. It may even be a broader reflection upon the faculty's willingness to share its ideas, concerns and vision for that department. This is now an isolated example, but it makes the point.

FNL: *[Special Assistant to the Chancellor] Jay Keyser runs a very interesting series called random faculty dinners. You should attend some time. Often one finds very disgruntled faculty members willing to speak up in this environment. Among the items mentioned are what the faculty have lost over the years: the \$800 per year travel allowance; much better support of graduate students via tuition remission; the loss of health benefits following retirement (which have been diminished substantially); and these decisions seem to be made by a small group of administrators. It's true there is some faculty input, but faculty members never really hear about many of these "smoke-filled room" decisions until it's a done deal.*

DM: I don't think much of this is done in the proverbial smoke-filled room. President Hockfield has worked to air out and broaden the decision-making process. We have talked a lot more publicly about the Institute's finances and the finance process. But you asked earlier about what's facing us. Short term I think we've got to get this team on board and functioning smoothly. I think the second thing is to assure that, going forward, we're continuing to be financially stable and growing.

FNL: *There doesn't seem to be a good connect between the financial management structure and the true expenditures down the line. The department heads come into the position completely untrained to deal with the financial aspects of the job, so basically they have to rely on their administrative officers, because they have the institutional memory.*

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Dana G. Mead

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DM: I've often said that we should consider having a "boot camp" for new department heads to provide them with better background for managing their departments.

FNL: *Can you be more specific?*

DM: Well, for Visiting Committee chairmen who are all Corporation members, I started what we call boot camp, actually a briefing set that deals with issues common to nearly all VCs; I have it once a year. We have it after the Corporation meeting in October. This initially was put together for new Visiting Committee chairmen, so they could put into context what they heard from the departments during the VC visits. We cover financing; we talk about space, recruiting, and we outline the approach the Visiting Committee should take as an oversight body rather than a management body, which is something I have to keep in mind too. My mission is to observe, to comment, and I can help initiate programs that will assist the president, the faculty, and the people who run the place in doing their jobs better. But I don't have a direct lever into the management, and I'm not supposed to have it.

FNL: *Here's a question that might engender a sound bite or two in terms of this interview. When Susan was just coming in she made a comment that she didn't see why a place like MIT, which was widely viewed as the national science university, shouldn't be pulling in significant support from sources in the private sector very different from those that normally support our programs. Should we not be competing for the same individuals who are supporting Yale, Princeton, Harvard, Stanford, and other institutions, people trained in business schools and non-science departments? What do you think of that? Do you think that's a realistic goal? Is the Corporation or our fundraising people making any efforts in that direction?*

DM: I think Susan is exactly right. I happen to agree with the sentiment. We know generally why this has occurred, and that a huge amount of MIT's effort goes to basic research and basic discovery. Corporations over the last two decades have moved away from that to "How does this apply to the next round of engine development?" or "How does this apply to the next round of avionics that are going to go into those warplanes?" and so forth. And the boards in corporate America have been very tough on management investing in research if they can't explain how it contributes to the bottom line that year or the next year.

FNL: *That's the point. They want a three-year timeline for what is really a 10-year timeline.*

DM: Right. And so getting by that is a very long-term effort. I don't think it's impossible. I sit on the Pfizer board and the company spends nearly \$8 billion per year on research and development. I think that because the costs are so high in corporate America to do this kind of research that one can begin to make a strong case that there should be more support of university research, particularly on the discovery end. And we're beginning to see it: Novartis is here and Pfizer now has this unit nearby, as well as others. On the harder side are automotives, aircraft, and so forth. But I think we need a full-court press on this challenge, and frankly when we look at the Corporation membership this is something we consider. We want people who understand the value of MIT to the business world and to businesses at large so they can support our research and educational efforts.

FNL: *What's the foreign composition of the Corporation?*

DM: It's very small.

FNL: *And should it be higher?*

DM: Yes, it should be.

FNL: *Are there Asian members?*

DM: Yes, but that's the only meaningful foreign membership. We don't have any European representation on the board right now. We do have members from Taiwan and Hong Kong.

FNL: *Anybody from mainland China?*

DM: No. That will be next. And as an example of how important these members can be, we have a prominent Taiwanese Corporation member who runs the largest chip maker in the world. He's great for MIT out there. We expect to put a prominent Singaporean on the Corporation in the near future. And as for Japan – I've already mentioned the value of the faculty in establishing relationships and raising money there. The Industrial Liaison Program in Japan has also been incredible. And these relationships make recruiting for the Corporation in Japan easier. But in Europe we're weak. I have spent a lot of time with the French recently because they want to create their own "MIT." You've probably heard this dream they have, and I've been trying to convince them that it took us from 1861 to this point to get where we are. Still we do need more international representation.

FNL: *What about all the international alliances and programs that we are forming? There's the SMART Center in Singapore and these other relationships. It seems we need to assess the benefits, costs, risks, the amount of influence that governments of different nations might have on our research – issues similar to the ones we discussed earlier when dealing with corporations.*

DM: I really can only speak for myself there because we haven't really discussed this particular issue at the Corporation meetings. But I think the general view, and it certainly is mine also, is that it's wise for us to take a more active role in these international areas, but with a few caveats;

that they do not become a burden to our faculty, that the resources are there, that they meet MIT's high academic and research standards, and that we understand where it's all going to end up. In other words, an end game, if necessary.

FNL: *There is some concern among the faculty that the intellectual integrity of the program does not live up to the intellectual integrity of our own internal programs. And to some extent some of these programs have been brought on at a relatively high level administrative/faculty structure – provost, department heads, etc., and not necessarily reflective of what the faculty would support.*

DM: What leads to this concern?

FNL: *The nature of the applicants, participants, whether they would be admissible under our normal criteria of excellence.*

DM: Are you talking about the Research Center or are you talking about the educational side?

FNL: *The educational piece of it.*

DM: As far as the Research Center, someone asked me how could Singapore support a research center of the quality that MIT is going to expect, and demand. I said, well a place with four million people isn't going to be able to do that by itself, no matter how hard they try. But that isn't their idea. As I understand it, their idea is that they'll attract much of the top intellectual talent in South Asia, China, and Southeast Asia, to this center by virtue of MIT's involvement there. Researchers from those areas will want to come and work with the really outstanding people that we envision are going to go there from MIT.

FNL: *And what's in it for us?*

DM: Well we get 10 chairs basically, over an extended period, and we get an important presence in Southeast Asia, I mean a big one, which we don't have.

The educational part there now is nice; but that's not putting the core capability of MIT into Asia. The other part of our core is research, collaborative research, on the very highest level of excellence.

FNL: *For example, there were significant issues with the Cambridge/MIT initiative.*

DM: I heard there were. What are you thinking of?

FNL: *Well, many faculty taught the Cambridge students when this first came about. The program was put into place—somewhat hurriedly, with what some believed to be insufficient departmental consultation, and the same was true of our colleagues over in England.*

DM: They weren't consulted?

FNL: *Some weren't, and they wrote and said, well, let's get things going. The students they sent were first-rate, but the programmatic aspect was lacking. So the big question is, to what extent do we want top-down programmatic situations being run on the research side and the educational side driving the way we do business, as opposed to bottom-up? That's the question.*

DM: I think you know the answer to that question, but the execution is where the problem lies. When these ideas get introduced frequently they are from the top level. A lot of them could come out of the bottom but they probably don't. But once they start being developed then that's when the consultation ought to be done with the people that actually execute the program, and basically that's the faculty. So I don't have a quarrel with your basic concept, because collaboration at all levels in development of the program is the best way to be sure we get the execution right.

FNL: *What does the Corporation think of the faculty age profile? Do they worry about it? There was a faculty retirement initiative several years ago.*

DM: Yes, an early retirement program. Each Visiting Committee looks at the faculty profile. As you know it varies a lot by department; some have profiles older than others. The Corporation reviews this in reports from the Visiting Committees. In many cases the discussion reflects what the department head thinks about the age distribution and the various ways of addressing it, if necessary. It certainly is something we need to follow.

FNL: *Perhaps we're due for another early retirement program. The argument against it is that faculty wouldn't retire but just wait in anticipation of another program. But it would be quite important to the Corporation, wouldn't it?*

DM: Absolutely. In my experience in corporate life and not-for-profits, I find these things are cyclical. You go through this cycle: first you build up a chronological “bow wave” that results in a special early retirement program which relieves the problem, and then over time you create a new “bow wave” and so on. I don't see that we're there yet, but I could be wrong. So between you and me I haven't heard any rumblings in the administration about it. But we do hear about it in the Visiting Committee reports, and as I say some departments talk about it more than others.

FNL: *Anything you'd like to say that we haven't brought up?*

DM: I liked the article about the Corporation that was in last May's *Newsletter*. Each year when we bring in new members of the Corporation we have an orientation for them. The required reading is the *Faculty Newsletter* on how the Corporation works.

FNL: *Thank you very much for your time.*

DM: It was my pleasure. ■

Sixty-six Years of Sponsored Research
Canizares, from page 1

sumer price index, which almost surely underestimates the effective inflation rate for research). The onset of substantial, external research funding at MIT began in 1940, as the U.S. government responded to the outbreak of war in Europe (in two years, research funding increased from \$105,000 to \$5.2M). The most precipitous downturns occurred following the closing of the Radiation Laboratory at the end of World War II and after the divestiture of Draper Laboratory in the 1970s.

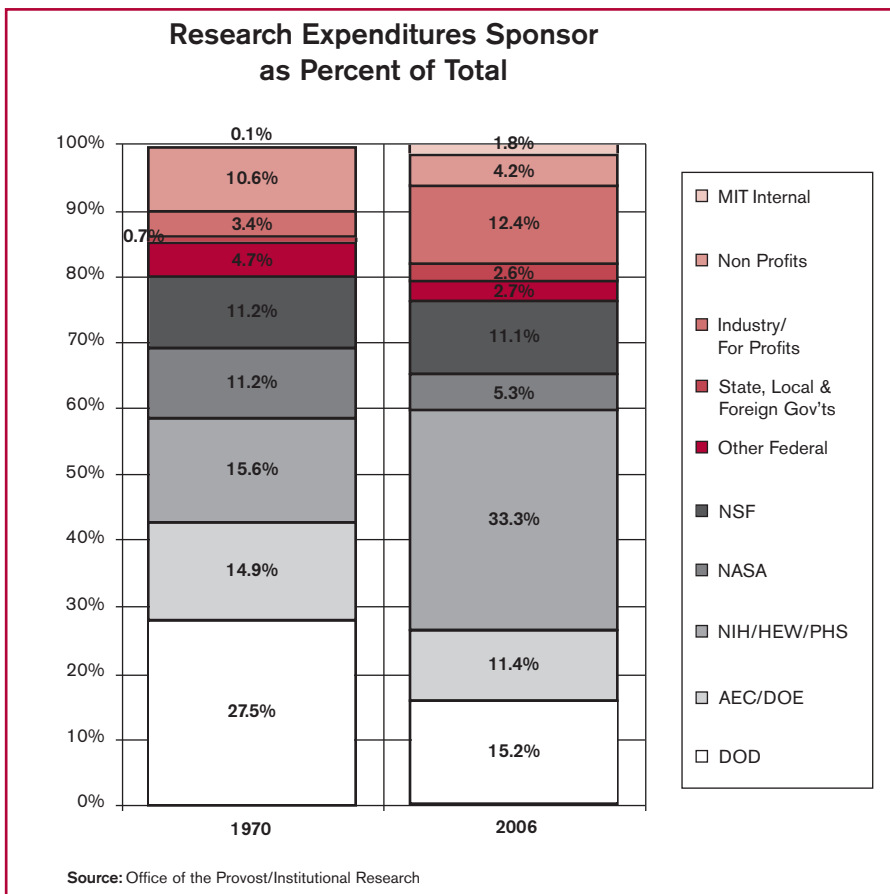
The biggest and most sustained increase, lasting nearly two decades, coincided with the Cold War period and includes the founding of Lincoln Laboratory. The 1990 post-Cold War era saw stagnation in federal funding for MIT Lincoln Laboratory and for some areas of physical science and engineering research on campus, while inflation continued to erode the purchasing power of research dollars. There was an additional small downturn during that decade related to a decline in faculty size following an early retirement program (designed to help the Institute cope with the elimination of mandatory retirement by federal law). The dip in the early 1970s coincided with the so-called Mansfield amendment, which put restrictions on non-military funding by the Department of Defense.

In the past few years, both campus and Lincoln Laboratory have seen increases in research volume. The growth in on-campus research is due to the founding of the Broad Institute – other on-campus research has been roughly constant for the past four years. As the M.I.T. Numbers graph shows, the total 2006 research volume is slightly below that of 2005, after correction for inflation.

Sources of Research Support

In FY1957, federal support of research on campus comprised 89% of the total. During the 1990s and through 2003, the percentage of federal support decreased to ~ 75%; in FY2006 it was up slightly to 79%.

Within the category of federal support, there have been dramatic, long-term



changes in the mix of sponsors (see figure). Focusing on the last 35 years, in Fiscal Year 1970 the largest sponsor of on-campus research was the Department of Defense, which accounted for 28% of research expenditures, while the group of sponsors that is now Health and Human Services funded 16%. In 2006 this ranking was reversed: HHS sponsored 33% of all research on campus and the DOD's share had dropped to 15%. The percentages for several other agencies that fund primarily physical science and engineering research also declined, such as NASA (from 11% to 5%) and the Department of Energy (formerly the Atomic Energy Commission, from 15% to 11%), while the National Science Foundation held steady at 11%. These changes largely mirror well-known national trends, in which the NIH research budget doubled (and then stagnated) while those of other agencies declined or remained roughly flat.

Within the non-federal arena, there has been a trade-off in the relative importance of non-profit (foundation) and

industrial sponsorship. Between 1970 and 2006 the foundation percentage declined from 10% to 4%, while industrial sponsorship grew from 3% to 13%. The contribution from state, local, and foreign governments, while small, more than tripled, from 0.7% to 2.6%.

Research Volume and the Number of Researchers

It is interesting to compare the overall volume of research on campus with the number of faculty, graduate students, and other research staff. In 1940, MIT's faculty numbered just under 300 and in 2006 it numbered almost 1,000. In 1940, MIT had 721 matriculating graduate students and at most a handful of research staff, while in 2006 there were over 6,000 graduate students and 2400 research staff (including postdocs and all ranks of research scientist/engineer). As noted above, the decline in faculty size due to the early retirement incentive of 1997 is correlated with a decline in the research volume.

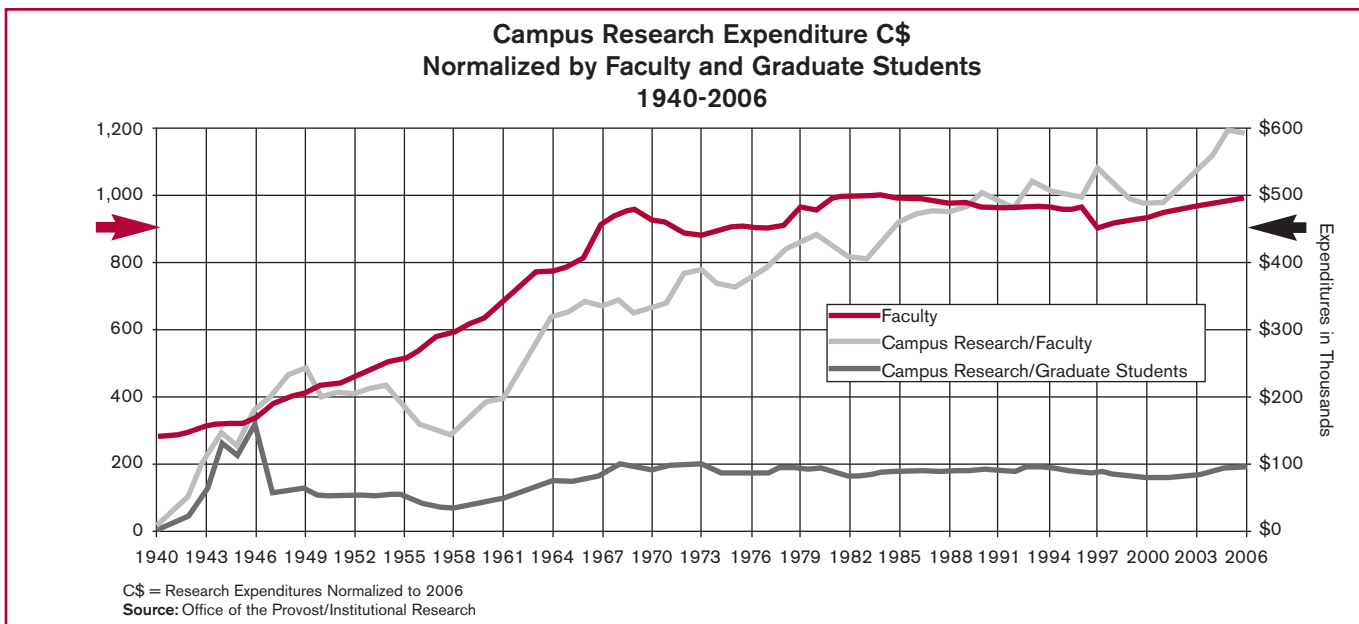
The figure below shows research expenditures (in constant dollars) normalized by the number of faculty, and separately by the number of graduate students. While there has been a slow, continual increase in the research volume per faculty member, the expenditures per graduate student have remained fairly constant since the mid 1960s. During the same period of time the number of graduate students per faculty has increased from 2.5 in 1940 to 6.2 in 2006, and the number of research staff per faculty grew from ~ 0 to 2.4. Clearly the makeup of the average research group has changed considerably over the last half-century.

compound annual growth rate of 5.4% in actual dollars or 1.8% in constant dollars) they have declined overall relative to the total for this group.

Interestingly, MIT's share of life science research funding compared to AAU members has recently increased, but in engineering and physical sciences the share has declined. It will take further analysis to understand the full significance of these data, but one observation is that MIT's fraction of federal research, excluding medical disciplines (an attempt to adjust for the absence of an MIT medical school), has remained high. We have held the top rank in this category throughout the 25-year period. Most of the higher growth of other AAU institutions has been from non-federal sources.

enced by external forces, such as trends in agency funding, federal priorities, and the level of industrial interest in supporting research.

For the past 60 years, MIT faculty and senior staff have helped to shape those external forces by serving on national advisory panels, testifying in Congress, and helping to write influential reports. We must continue such efforts, especially in this very challenging year (despite the fanfare of the American Competitiveness Initiative, the failure of Congress to pass most appropriations bills this fall has locked agency budgets at their FY 2006 levels). At the same time, we can also benefit by formulating collective strategies to address the current realities and to



A National Perspective

While MIT continues to be a leader in both the quantity and, more importantly, the quality of our research, it is instructive to put MIT's growth into a national perspective. One interesting and somewhat surprising measure is MIT's "market share." MIT is one of nearly 200 research universities. We have data (compiled by the National Science Foundation) for a significant and important subset of this group, the 60 members of the Association of American Universities (AAU). While MIT's research expenditures have grown significantly over the past 25 years (at a

In the Future

The consolidated data on research expenditures presented here are, of course, shaped by a spectrum of external and internal factors. Most research funding is secured by entrepreneurial Principal Investigators responding to opportunities presented by federal agencies, industries, foundations, or other potential sponsors. Occasionally, these efforts become major Institute initiatives, such as the Broad Institute. The long-term trends presented here suggest the unsurprising lesson that, in the aggregate, this largely decentralized, entrepreneurial system is strongly influ-

coordinate our attempts to change them. With the backing of the President and Provost, the Office of the Vice President for Research and MIT's Washington Office have begun to work with groups of faculty and others toward these goals. I welcome your input.

I am grateful to Lydia Snover for helping to compile the data in this report, and to William Bonvillian for helpful comments.

Claude R. Canizares is Vice President for Research and Associate Provost; Professor of Physics (crc@mit.edu).

New Policy on Faculty Travel on MIT Business

Lorna J. Gibson

IN RESPONSE TO REQUESTS from faculty, MIT has adopted a new policy designed to assist faculty with dependent care expenses associated with travel on MIT business:

“This policy provides for financial support to faculty for additional dependent care expenses associated with travel on MIT business, above those normally incurred by the faculty member while at MIT. Faculty are eligible to be

reimbursed up to \$1000 in direct expenses, plus 25% towards tax due on the expenses, per year in reasonable dependent care expenses. Such reimbursement will be additional compensation. Deans and Department Heads may, at their discretion, allow more than \$1000 in appropriate dependent care expenses per year.

“Junior faculty should apply through their Schools. Senior faculty should use

discretionary funds for dependent care expenses (plus 25% towards the tax due on the expenses) associated with travel on MIT business. Senior faculty without discretionary funds will be reimbursed by the Department, under the same conditions as the program for junior faculty.” ■

Lorna J. Gibson is Associate Provost
(ljgibson@mit.edu).

MIT Libraries Expands Historic Access to Electronic Journals

Anna Gold

IN A NOVEMBER 2005 Library Services Survey of faculty and students, one of the top requests for future enhancements was to “expand the historic depth of our online collection by providing more electronic access to older journals.”

While most current research journals have been available electronically since the 1990s, many older journals only recently have become available for purchase. Electronic access to earlier issues (“back files”) offers many advantages to researchers, allowing them to seamlessly link to and read journal citations going back many decades, without leaving their offices or labs.

To bring these benefits to MIT, the MIT Libraries recently acquired numer-

ous significant journal back files in fields of interest across the campus. Among the most widely recognized titles acquired were *Cell* (1974 -), *Nature* (1960-), *Tetrahedron* and *Tetrahedron Letters* (1957-), *Angewandte Chemie* (1962-), *Physics Letters B* (1967-) and *Journal of Fluid Mechanics* (1956-).

To learn more and see a listing of recently purchased collections and titles, including important collections in the life sciences, neuroscience, engineering, mathematics, chemistry, economics, physics, art and architecture, as well as major newspapers back to the nineteenth century, see: libraries.mit.edu/backfiles.

MIT Libraries provide electronic access to over 34,000 current and histori-

cal journals. Many are available to on-campus users by going directly to a journal’s Website – on-campus users are automatically recognized as being from MIT and granted access. Off-campus users with certificates can gain access through Vera (Virtual Electronic Resource Access) at libraries.mit.edu/vera, or by adding the Libraries proxy string to the publisher’s URL. (See: libraries.mit.edu/about/faqs/remote-proxystring.html for instructions.) The Libraries plan to purchase more electronic back files as demand for these resources grows and as funds become available. ■

Anna Gold is Head Librarian of MIT’s Engineering and Science Libraries
(annagold@mit.edu).

MIT Poetry

by Joe Haldeman

Eighteen years old, October eleventh

Drunk for the first time in her life,
she tossed her head in a horsey laugh
and that new opal gift sailed off her sore earlobe,
in a graceful parabola, pinged twice on the stone porch floor,
and rolled off to hide behind the rose bushes.

It gathered dust and silt for two centuries.
The mansion came down in a war.

For twelve thousand years
the opal hid in dark rubble, unmoving.
An arctic chill worked down through it, and deeper,
and glaciers pushed the rubble thousands of miles,
very fast, as opals measure time.

After millions of years (the Sun just measurably cooler)
a female felt the presence of a stone,
and waved away yards of snow and ice;
waved away dozens of yards of frozen dirt and crushed rock,
and held, in what resembled a hand,
this bauble of gold and rainbow stone:

felt the sense of loss in that silly girl,
dead as a trilobite;
felt the pain that had gone into penetrating
the soft hyperbolic paraboloid of cartilage
that then displayed the decoration;
felt its sexual purpose:
to attract a dissimilar pattern of genes
to combine and recombine a trillion trillion times,
and become herself.

She briefly cherished the stone,
and returned it to its waiting.

Joe Haldeman is Adjunct Professor of Writing at MIT and an acclaimed science fiction novelist. This poem first appeared in Isaac Asimov's *Science Fiction Magazine* in August 1990, and won the Rhysling Award for best science fiction poem of the year.

New Tax Law Allows IRA Gift Giving made easier until January 1, 2008

Judith Sager

PRESIDENT BUSH SIGNED INTO law on August 17, 2006, an important provision of a new tax law that will have the greatest impact in providing tax incentives for new charitable gifts for current or retired faculty members who are 70 1/2 and older. Under the new tax law, taxpayers can now contribute to a charity directly from their Individual Retirement Accounts (IRAs).

The Pension Protection Act of 2006 (PPA 2006), as the new law is called, allows individuals to make distributions of up to \$100,000 from their traditional, rollover, or Roth IRAs without those distributions counting as gross income. Prior to PPA 2006, a donor would have had to report the \$100,000 withdrawal as income, and then declare an offsetting income tax deduction for the charitable contribution.

The IRA charitable rollover provision has a shelf life, however: It is effective only through December 31, 2007.

To qualify for the rollover provision, donors must be at least 70 1/2 years of age at the time of the transfer; the funds must pass directly from the IRA custodian to

the qualifying charity (i.e., a withdrawal followed by a contribution would still need to be reported as income); contributions are limited to \$100,000 per tax year; and the charity must be a tax-exempt organization to which deductible contributions can be made.

Contributions may not be directed to donor-advised funds or supporting organizations, nor may they be used to fund charitable gift annuities or charitable remainder trusts. Further, PPA 2006 applies only to traditional, rollover, and Roth IRAs – not to other types of plans like 401(k)s, 457s, 403(b)s, etc. And finally, there is no federal income tax deduction available for such gifts in addition to their income exclusion benefits.

Tax experts anticipate that the window of opportunity will most appeal to qualified donors who have well-funded IRAs and more than enough financial assets to live on or to pass on to their heirs; who need to take minimum distributions from their IRAs anyway – distributions that would normally be taxed; who don't itemize their deductions; for whom this

provision could lower their AMT; whose income level causes the phase-out of their exemptions; who live in states with no charitable deduction; who already contribute at their 50 percent deduction limit; or for whom additional income would cause more of their Social Security distributions to be taxed.

It's important to emphasize: Congress has specified only a finite period of time in which to make contributions to charitable organizations from Individual Retirement Accounts. The new rules expire on January 1, 2008; thus, anyone who is 70 1/2 now or will be before January 1, 2008 and meets the other qualifications can make a \$100,000 charitable gift and benefit from this new law, for each of the 2006 and 2007 tax years.

Before you reach any decisions about using the IRA rollover provision, please consult your attorney, accountant, or other financial advisor to be certain that you are, in fact, eligible to take advantage of this important change in the law. ■

Judith Sager is Director of Gift Planning
(jsager@mit.edu).

Newsletter Included in Institute Communication Survey

THE MIT FACULTY NEWSLETTER will be one of the publications about which you will be queried in the online Communications Survey to be conducted in March. The purpose of the survey is for the Institute to better understand topics and issues of importance to the MIT community, as well as the best communication channels for connecting with members of

the community. Faculty, students, staff, and alumni will be asked to participate in the survey.

Results from faculty participation in this research effort will help shape future plans for disseminating news and information at MIT, including new technologies and methods, and provide insights into potential new areas for content

development. In addition to exploring topics of interest to the community, the questions to be explored include: How do people at MIT currently receive and seek information, and how would they like to receive it? The survey is sponsored by the Office of the Vice President of Institute Affairs. ■

M.I.T. Numbers MIT Operating Budget (FY2007)

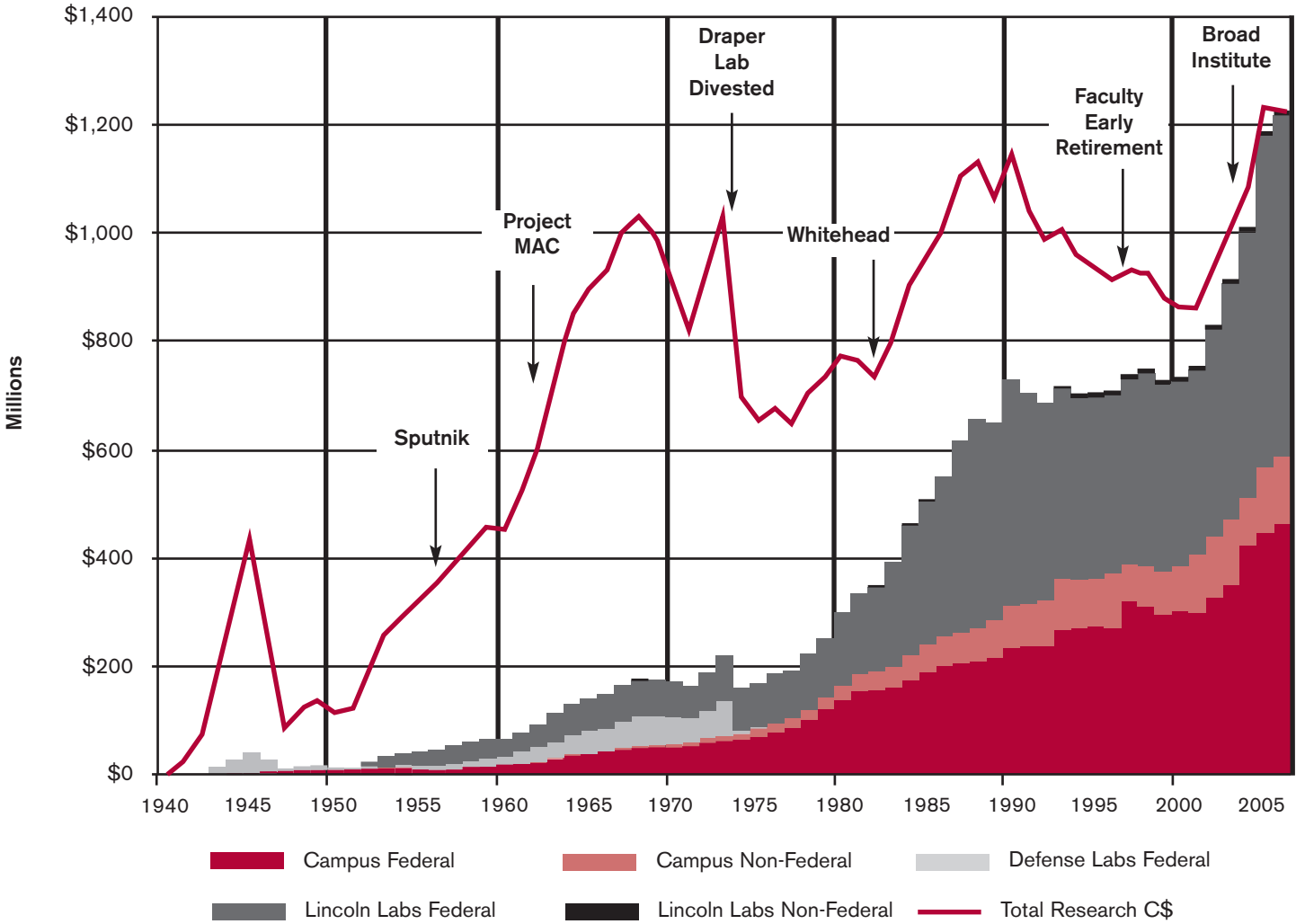
\$Millions	FY06	FY07	FY07 - FY06	
	Budget	Budget	\$	%
REVENUES				
Tuition & Financial Aid:				
Undergraduate Tuition & Fee Revenue	130.8	134.7	3.9	3.0%
Undergraduate Financial Aid	(58.2)	(60.7)	(2.5)	4.4%
Graduate Tuition & Fee Revenue	249.1	255.9	6.8	2.7%
Graduate Financial Aid	(124.0)	(126.6)	(2.5)	2.0%
Tuition External Transfers	(4.0)	(4.7)	(0.6)	15.9%
<i>Subtotal Tuition & Financial Aid</i>	193.7	198.6	5.0	2.6%
Sponsored Research:				
Campus Direct Costs	430.5	436.4	5.9	1.4%
Campus F&A	183.1	208.5	25.4	13.9%
Lincoln Labs Direct Costs	597.3	626.1	28.8	4.8%
Lincoln Labs F&A	34.5	35.0	0.5	1.4%
<i>Subtotal Sponsored Research Revenues</i>	1,245.3	1,306.0	60.6	4.9%
Gifts & Bequests for Current Use	94.0	94.5	0.5	0.5%
Fees & Services	86.2	96.4	10.2	11.8%
Support from Investments				
Pool A Distribution	266.0	286.1	20.1	7.6%
Pool C Earnings	49.7	53.5	3.8	7.6%
Other Invested Funds	5.0	5.2	0.2	4.0%
Funds voted for Distribution	5.0	5.0	-	0.0%
<i>Subtotal Support from Investments</i>	325.7	349.8	24.1	7.4%
Auxiliary	88.3	83.8	(4.5)	-5.1%
Net Asset Reclass & Other Programs	67.0	117.3	50.3	75.1%
TOTAL REVENUES	2,100.2	2,246.4	146.2	7.0%
EXPENSES				
Campus Expenses:				
Compensation	615.7	636.1	20.4	3.3%
Employee Benefits	157.0	158.9	1.9	1.2%
Materials and Services	710.2	763.2	53.0	7.5%
Interest Expense	45.0	52.0	7.0	15.5%
<i>Subtotal On-Campus Expenses</i>	1,527.9	1,610.2	82.4	5.4%
Lincoln Labs Expenses:				
Lincoln Direct	597.3	626.1	28.8	4.8%
TOTAL EXPENSES	2,125.1	2,236.3	111.2	5.2%
Additional Endowment Support	62.9	77.3	14.4	22.9%
Results of Operations	(25.0)	10.0	35.0	-140.2%
Net Assets Changes				
Current & Other Invested	83.0	186.0	103.0	124.1%
Endowment Unrestricted	37.0	64.0	27.0	73.0%
Endowment Restricted	256.0	251.0	(5.0)	-2.0%
Plant Equity	57.0	(27.0)	(84.0)	-147.4%
TOTAL CHANGE in NET ASSETS	433.0	474.0	41.0	9.5%

Source: Office of Budget Operations

M.I.T. Numbers

MIT Research Expenditures (FY1940-2006)

Campus, Lincoln Laboratory, Draper Laboratory



Source: Office of the Provost, Institutional Research