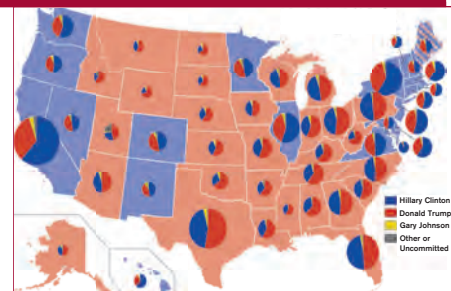


MIT Faculty Newsletter

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

in this issue we offer responses to the recent Presidential election (Editorial and “A Message From MIT Faculty,” below, and “On Gracious Professionalism,” page 4); “Skoltech – A Personal and Professional Journey,” page 8; and “Evolution of Schools, Departments, and Centers at MIT,” page 14.



2016 Presidential Election By Vote Distribution

A Message From MIT Faculty Affirming Our Shared Values

THE PRESIDENT-ELECT HAS appointed individuals to positions of power who have endorsed racism, misogyny and religious bigotry, and denied the widespread scientific consensus on climate change. Regardless of our political views, these endorsements violate principles at the core of MIT’s mission. At this time, it is important to reaffirm the values we hold in common.

We, the undersigned faculty at MIT, thus affirm the following principles:

- We unconditionally reject every form of bigotry, discrimination, hateful rhetoric, and hateful action, whether directed towards one’s race, gender, gender identity, sexual orientation, religion, national origin, disability, citizenship, political views, socioeconomic status, veteran status, or immigration status.

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Can A University Become Carbon Neutral?

Timothy Gutowski

THIS IS THE QUESTION we took up as a class project in 2.83/2.813 for the spring term 2016. We looked at the climate action plans of 22 colleges and universities in the U.S. (and four more in Europe), including 10 who signed the American College and University Presidents Climate Commitment (ACUPCC) and claimed they would be carbon neutral by 2016. The short answer to this question is a conditional yes. Of the 10 first movers, five are, or soon will be, carbon neutral; however, the solutions they use are not scalable, or have other issues, and the schools are arguably only able to achieve carbon neutrality because of their unique circumstances. Having said that, we should give them credit for their accomplishments.

The successful schools (all from the Northeast) are generally small, mostly

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Editorial

Resisting Anti-Science Stances of the New Administration

U.S. PRESIDENTS HAVE HAD a history of enthusiastic and constructive engagement with science and technology. Notable among them have been Washington and Jefferson, Lincoln, Roosevelt, Kennedy, Jimmy Carter, and Barack Obama. In fact, the growth and health of the U.S. economy post-World War II was the product, in large part, of the far-sighted and generous public investments made through the National Science Foundation, National Institutes of Health, NASA, NOAA, and the Department of Energy, in computer science, materials science, telecommunications, biomedical research, environmental and geophysical programs, and many other disciplines.

President-elect Trump has nominated as a leading member of his cabinet an individual who dismisses the scientific

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Subscriptions

\$15/year on campus

\$25/year off campus

Vol. XXIX No. 2 November/December 2016

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Resisting Anti-Science Stances

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evidence for human-induced climate changes, probably the gravest challenge of our times. Indeed, the President-elect's staff has threatened to tear up the Paris climate accords. Many other of Trump's statements cast aspersions on the activities of our scientific and technological communities, giving warning of additional difficulties ahead.

In response, members and organizations of our scientific, computational, engineering, and architectural communities need to step up to the plate and protect and foster the advances in environmental understanding that have been achieved. MIT faculty occupying execu-

tive positions in their professional societies should promote public statements by their societies in support of public policies informed by scientific evidence.

This is a crucial responsibility of our scientific community. We are called upon to proactively refute the promotion of half-truths and unfounded positions irrespective of any prudent inclinations to avoid rocking the boat with federal funding agencies.

Political developments in the post-World War II decade made the scientific community almost totally dependent on support from federal funding agencies. Given that almost all of these agencies reside in the executive branch of the government, there will be many among our peers that depend on that funding who

may be loathe to publicly challenge the policies of the President-elect or his appointees. In such a situation, letter writing and petition campaigns that proceed outside organizational boundaries may also be needed to protect our scientific integrity.

We note that cabinet nominations require Senate confirmation. This means that the scientific community can work with the Senate to oppose the nominations of doubters and deniers of human-induced environmental damages. This can be done at many levels, including professional societies, private communications, and political channels. ■

Editorial Subcommittee

A Message From MIT Faculty

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- We endorse MIT's values of open, respectful discourse and exchange of ideas from the widest variety of intellectual, religious, class, cultural, and political perspectives.
- We uphold the principles of the scientific method, of fact- and reason-based objective inquiry. Science is not

a special interest; it is not optional. Science is a foundational ingredient in how we as a society analyze, understand, and solve the most difficult challenges that we face.

For any member of our community who may feel fear or oppression, our doors are open and we are ready to help. We pledge to work with all members of the community – students, faculty, staff, postdoctoral researchers, and administra-

tors – to defend these principles today and in the times ahead.

(Please contact Professors Roger Levy [rplevy@mit.edu] or Nancy Kanwisher [ngk@mit.edu] with any questions.) ■

Editor's Note: At press time the above statement was signed by 554 MIT faculty members. To view the list of signers or to add your name to the list, see: www.mitvalues.org.

On Gracious Professionalism™

Woodie Flowers

THE ELECTION HAS BEEN PAINFUL.

It reminds me that we have a responsibility to help students become thoughtful citizens. Rational thought blended with empathy seems too rare everywhere.

Personal experience leads me to believe our students would be receptive to hearing us address their obligations to society. Dean Kamen founded FIRST (For Inspiration and Recognition of Science and Technology) in 1989. A couple of years later, Dean and I co-founded the FIRST Robotics Competition (FRC) patterned after the creative design exercises I had been running for many years in the Mechanical Engineering design courses. The “2.70 Contest” was anchored by “gracious professionalism,” a term I coined to celebrate the wonderful behavior prevalent among students in that course. They competed like crazy, but treated one another with respect and took pride in helping and teaching one another.

At the first FRC Kickoff, I used one slide with the term “Gracious Professionalism.” Encouraged by Dean, at the second FRC Kickoff, I used six slides featuring the phrase. Since then, Gracious Professionalism™ has become a powerful part of the ethos of the whole FIRST community. FIRST competitions have grown and have millions of alumni. Scattered over 80 countries, young people have embraced the notion that competition and kindness are compatible. At MIT, 10% of our freshman classes are FIRST alumni.

As we make the transition to digitally-enhanced learning and machine-assisted professions, I believe “uniquely-human” will be a powerful differentiator. Professionals who understand the laws of the universe and also have an emphatic response to others will be the leaders. Those who think science is *a la carte* will have aspirations that Mother

Nature will not tolerate. MIT students will have an obvious advantage because of their understanding of what is possible. We need to make sure they are also well equipped to manifest creativity, leadership, good judgment, and ethical behavior.

I offer Gracious Professionalism as a convenient label. It blends rigorous adherence to the laws of the universe with the human qualities we hope to see as those laws are applied by our alumni. Giving back with conscience. Blending hard knowledge with soft feelings. Facts, feeling, and fairness. The FIRST community, which includes all ages, have embraced “GP” and actually compete to “out GP” one another.

How might Gracious Professionals have voted? ■

Woodie Flowers is the Pappalardo Professor Emeritus of Mechanical Engineering (flowers@mit.edu).

Can A University Become Carbon Neutral?
Gutowski, from page 1

liberal arts colleges in rural settings in states with below average carbon intensity electric grids (Vermont, Maine, and New York). They all appear to have a strong environmental identity and started on their carbon-neutral path as soon as the ACUPCC was signed (2007), or slightly before. They all appear to have sufficient, to significant resources including land as well as money. The most practiced solutions were, approximately in order of prominence: 1) burning wood, 2) buying carbon credits, 3) claiming sequestration from owned forests, and 4) burning syngas from cow manure. Everyone practiced some level of energy efficiency, but it was the four actions listed above that appeared to make the difference.

For larger universities with engineering and science laboratories, or with medical schools, the task is much more difficult. Second Nature, the group that is tracking the progress of the 679 signers of the ACUPCC agreement, provides data showing that “industrial-strength” universities such as MIT are about four times more carbon intensive per full-time enrollment (FTE) than the baccalaureate colleges (28 metric tons of CO₂e/FTE versus 7tCO₂e/FTE). MIT currently stands at about 20tCO₂e/FTE, but our accounting is ongoing with potentially important pieces still missing (for example, institute travel, procurement, and waste).

Our acknowledgment of the success of the five schools is conditional, because each of the methods used to obtain their carbon neutral goal has some level of controversy that needs comment.

Wood burning is often assumed to be approximately carbon neutral over the long term, and can be feasible for a school if pollution is addressed, the demand is modest to reduce truck deliveries, and supply is available. Even so, wider use of wood has several issues: it is limited in supply, land intense, and would compete with cropland and affect food prices if developed on a large scale. In other words,

it is not scaleable. Nevertheless, for these small applications, and from a carbon emissions point of view, burning wood cleanly is still better than using fossil fuels. It is worth noting that there are some

The free market approach of paying someone else to reduce their emissions and claiming the credit, i.e., buying carbon credits, could be an efficient way to address this problem. The idea is to direct resources to the best opportunities. We found that four out of the five successful schools used some level of carbon credits to obtain their goal.

sophisticated new technologies for burning wood including a 2MW combined heat and power biomass gasification unit at the University of British Columbia. It is also worth noting that there are remaining issues concerning the effect of harvesting on Net Primary Productivity for the decades immediately after the harvest.

The free market approach of paying someone else to reduce their emissions and claiming the credit, i.e., buying carbon credits, could be an efficient way to address this problem. The idea is to direct resources to the best opportunities. We found that four out of the five successful schools used some level of carbon credits to obtain their goal. Note that for a small school with relatively low emissions, say 4tCO₂e/FTE (a real case), one can appear to solve the problem by buying low cost carbon credits at about \$10/tCO₂e with a resulting cost of \$40 per student per year. The chief challenges to this solution are related to risk and a potential moral hazard. That is, the effectiveness of some schemes can be hard to confirm, and potentially could lead to mischief. Morally, the Harvard philosopher Michael Sandel has argued that “turning pollution into a commodity to be bought and sold removes the moral stigma that is properly associated with it . . . [and] may undermine the sense of shared responsibility that increased global cooperation requires.” These problems aside, if you

follow this path, it requires an ongoing payment until you actually do get your carbon emissions down. For MIT, buying high quality carbon credits at \$20/tCO₂e (to reduce risk and ensure effectiveness)

and assuming that full accounting puts us at 25 tons CO₂ per FTE would cost \$500 per student or a yearly total cost of \$5.5 million.

Several schools with large tracts of forested land are claiming carbon credits for increasing carbon sequestration on those lands. Although the protocols are still being worked out, the general idea is that by using improved forestry practices, one can manage a tract of land to increase the stored carbon (usually in the standing trees) over some considerable length of time, i.e., 40 to 100 years. If you have enough land, you can even sell these credits and make a profit, as at least one school said they are doing. If MIT were to try to engage in this practice, we would find ourselves at a noticeable disadvantage. Our campus land area of 68 hectares (ha) is about an order of magnitude smaller than our fellow industrial-strength university campuses. We found several examples of this carbon credit method. One was provided by the California Air Resource Board (ARB) with claims of an improvement potential of 1.56 tC/ha/yr (over 100 years) for forest in California (Willits Woods in Mendocino County). Using this number, MIT would need the land area equivalent of about 500 of our current campuses to sequester our 200,000 metric tons of CO₂ equivalent per year. That is, we would need to find

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Can A University Become Carbon Neutral?
Gutowski, from preceding page

this land and develop it over 100 years. (This scheme does raise some questions that need more discussion.)

Finally, two schools (both in Vermont) claimed to have developed a scheme to use syngas produced from cow manure. This plan requires, among other things, investment in a bio-digester, infrastructure to transport the gas to the school (a pipeline is preferable) and, of course, a sufficient supply of cow manure. This struck us as one of the more creative solutions. Unfortunately, we learned from one school that the current low price of natural gas has made such an investment questionable, resulting in a delay and causing that school to develop alternative options.

In comparison to the smaller schools, the bigger technical universities, with more in common with MIT, have, understandably, much higher emissions and more modest percent reductions. As mentioned earlier, the larger technical universities have roughly four times the carbon emissions per student compared to the smaller undergraduate institutions. In addition, the larger schools we studied have roughly 10 times the students (~20,000 versus ~2,000) hence the emissions from the larger universities are roughly 40 times larger (e. g., 200,000 tCO₂e versus 5,000 tCO₂). Changes in CO₂ emissions from these universities, over roughly the same length of time as the smaller institutions, ~9 years, range from an increase of 6%, to a decrease of 32%, with an average decrease of 9%. While this appears to be a much more modest reduction than the smaller first movers, in terms of absolute reductions, it is actually larger. That is 9% of 200,000 is more than three times the total emissions previously emitted by our prototypical small carbon neutral college (~5,000 tCO₂e). Hence, only looking at relative reductions could be misleading. Furthermore, using percent reduction in carbon emissions as the metric to judge improvement has an additional disadvantage in that it can favor late movers, for

example those who only recently have converted from coal to natural gas for their power plant. In fact, this is part of the explanation behind the 32% decrease mentioned above. If you remove the power plant conversion from their data, we estimate the improvement is about 22%. For your information, MIT is not at all a late mover. MIT switched from coal to oil in 1935 and from oil to natural gas in 1995.

We found that the improvement strategies at the larger schools were somewhat different than those employed by the successful first movers. There was little mention of wood burning boilers, forest sequestration, and biogas from cow manure. There was a strong emphasis on energy efficiency, as with the small schools, and alternative renewable energy sources.

We found that the improvement strategies at the larger schools were somewhat different than those employed by the successful first movers. There was little mention of wood burning boilers, forest sequestration, and biogas from cow manure. There was a strong emphasis on energy efficiency, as with the small schools, and alternative renewable energy sources. These renewable energy sources included photovoltaic panels, land-based wind turbines, small geothermal applications, small hydroelectric installations, and even water exchanges from deep lakes for building cooling. The general theme was to look for local opportunities and exploit them. And again, having a large land footprint is very helpful to accommodate these alternative land intensive energy sources. For those who do not have sufficient area to accommodate these projects, they could support their development at remote sites, and could possibly qualify for carbon credits. (More on this later.)

We found it difficult to assess the effectiveness of the various energy efficiency activities because the schools generally report their emissions at an aggregate level without sufficient detail to estimate these effects. However, the average energy use

and carbon emissions per building area for some of these schools is far removed from current best practice, and it is reasonable to expect significant potential in this area. MIT has been working at this problem for some time with some success, but even so our current average energy use per floor area is about double best practice. It is worth pointing out that a major component of this high-energy use is our reliance on very high air exchange

rates to ensure cleanliness and safety in our laboratories. And in addition, constant travel by people entering and leaving our buildings also leads to high air exchange rates. These are tough areas to address. We cannot compromise our standards for cleanliness, safety, and access, but could we meet them in alternative ways that reduce our air exchange rates with the outside? These problems need special attention if we are to be successful at reducing our building energy use.

Finally, there is the complication that successful universities are often growing. For the 11 universities for which we could gather building growth rates (in terms of floor area), we found a nominal average growth rate of about 3% per year. Yes, this is limited data, but it certainly rings true for us at MIT. A recent article in the *MIT News* suggests that our energy demand is expected to grow by 10% by 2030. Obviously, this significantly increases the challenge to become carbon neutral.

Part of MIT's challenge is that we have already made our move to natural gas cogeneration. There is no obvious renewable energy alternative that fits on campus and could meet all of our needs. Here in Massachusetts, the biggest opportunities for renewable energy are not on our

campus. They are offshore wind and hydroelectric from Québec. These options are, of course, well known, and are the subject of a recent important initiative by the Massachusetts legislature. But these will take time to develop, so in the meantime what should we (MIT) do? What we know is that many people at MIT are working on this, with new studies and more efficiency improvements in the works. But, we appear to be committed to on-campus natural gas co-generation for the next 20 years with plans to increase our capacity from 1 to 2 new 22MW turbines. So what seems clear, is that some off-site activities (e.g., carbon off-sets, and/or working with the local grid, etc.) will be necessary.

In fact, while this article was being written, MIT announced participation in a large new solar farm in South Carolina. MIT will purchase solar power said to be

equivalent to 40% of the Institute's current electricity use. This seems a significant move by MIT to take these steps in a relatively short time to address climate change. Those who have done this work on our behalf are to be congratulated. At the same time, it would be very helpful if more information about these carbon reduction claims could be made available to the wider MIT community. The article in the *MIT News* claims that MIT will "neutralize" 17% of its carbon emissions through the purchase of solar energy. But it is not immediately clear how our support for the development of this solar facility is going to neutralize our emissions. One needs to differentiate between renewable energy credits, and carbon offsets. In plain English, enabling low carbon growth and actually reducing real carbon emissions are two different things. Real reductions

require that a real source of carbon emissions be attenuated or shut down. Presumably this is part of how the new energy will be integrated into the local grid, but nothing was said about this. More information about this arrangement would be welcomed so we can understand the basis for these claims.

I would like to personally thank the students who worked so closely with me on this class project, in particular, Samantha Houston, the teaching assistant, Patrick Callahan and Rachel Perlman, as well as Sean Caetano, Tyler Capps, Wesley Cox, Aaron Downward, Amanda Hamlet, Matthew Hole, Patrick Linford, Jessica Press-Williams, Michael Sandford, James Slonaker, Prithivi Sundararaman, and Kevin Thomas. ■

Timothy Gutowski is a Professor in the Department of Mechanical Engineering (gutowski@mit.edu).

letters

Access MIT and Transit Commuter Benefits

To *The Faculty Newsletter*:

Re: "MIT Administration 'Walking the Talk' on Transit Commuter Benefits," by Frederick P. Salvucci, *MIT Faculty Newsletter*, Vol. XXIX, No. 1.

I INVARIABLY ENJOY READING your articles in the *Faculty Newsletter*. (I have appreciated your astute skepticism about plans for redevelopment near Kendall.)

This message is in reaction to your recent article about transit commuter benefits – not a response to the article, but a comment about the benefits themselves. It's great that MIT now fully subsidizes T passes. But to complete the picture, MIT

should also work with the MBTA to decrease congestion and increase capacity. Travel between Central and Kendall Squares during morning rush hour is no fun; it's sometimes necessary to let a train or two go by before being able to board. The buses along Mass. Ave. are also crowded, and often delayed.

I write you in the hope that you'll be able to pass along a suggestion to someone who can make useful decisions. It's unfair to non-MIT Cantabridgians to encourage use of public transportation without also pitching in ease crowding. I believe that the MBTA is contemplating the purchase of new Red Line cars. Maybe MIT could figure out some clever design

tweaks that would allow trains to hold more travellers, or to load/unload more quickly. Maybe MIT could subsidize salaries for train and bus drivers to allow more frequent service. Maybe MIT could develop safer signaling/braking systems that would allow trains in the subway tunnels at more frequent intervals. Or something else, t.b.d.

Please forward this message, or useful parts of it, as you see fit.

I look forward to your next FNL article.

Ken Pierce
Administrative and Web Assistant
Institute for Medical Engineering
and Science

Skoltech – A Personal and Professional Journey

Ed Crawley

Journey Begun

I WAS AT AN AIRSHOW with my son on the Fourth of July, 2011 when I received a call from Duane Bonning – was I interested in flying to Moscow to interview for the position of Skoltech President? When you come to a fork in the road, take it! This would either be the job of a career, or a really bad idea. As it turns out, it was the opportunity of 10 careers – to found not only a new university, but a new type of university centered on innovation, and designed to be an engine of economic growth.

This opportunity was a little less daunting for me than you might think – I had studied six years of Russian in high school and at MIT (thanks to a strong humanities program), enrolled one semester at Leningrad State University in the middle of the Cold War, and worked with the Soviet space universities in the late 80s. This was my third stint in Russia.

Facts on the Ground

Five years later, when I stepped down this past spring, we had succeeded in starting a new university. It has 10 international research programs, five Masters and PhD degree programs, a unique innovation program, over 75 faculty recruited from around the world, and 450 graduate students (about 20% international by design). The university is in interim buildings, and in the fall of 2017 will move into more than 1.4 million square feet of beautiful and state-of-the-art campus buildings. *Zero to one-quarter of CalTech in five years.* This could not have happened without the instrumental

support of MIT, the Russian government, the academic community in Russia, the Russian Academy of Science, and other universities around the world.

*Our intention at Skoltech was to build a “University 3.0.” . . . In University 3.0 the application of knowledge through innovation is the central mission. At Skoltech, we were not only building a new university but a *new kind of university.**

Background

In order to understand Skoltech (Skolkovo Institute of Science and Technology), it is important to view the context of modern Russia. On one hand, the economy runs on export revenues of raw materials, while almost everything Russians buy is imported. On the other hand, there are 300 years of scholarly tradition at the Russian Academy of Science, and a still vibrant university system. (My professional assistant was the daughter of the last student of Kolmagorov – you don’t find that just anywhere!) Russia has an engineering community that launched the first man in space.

Faced with these facts, any reasonable government would try to connect the scientific and technical horsepower with the needs of the economy. (And the parts of the government I dealt with were completely reasonable – the chair of the Skoltech Board is a Duke-trained economist and Deputy Prime Minister.) In order to make this connection, the government created the Skolkovo Foundation who are

building the Skolkovo Innovation Center. It is a supersized techno-park and innovation community on the western outskirts of Moscow.

The Russian government reasoned that at the heart of any such zone of intense science-based innovation there should be a university like MIT. They decided that none of their existing institutions could pivot quickly to this role, and therefore asked a handful of universities around the world if they would partner to establish a new university. MIT agreed, and committed to a three-year partnership, later stretched to 4.5 years, and now extended to 7.5 years through a Phase 2.

Objectives and Mission

Our intention at Skoltech was to build a “University 3.0.” University 1.0 started in Bologna, to preserve and pass along knowledge. University 2.0 is Humbolt, where the new mission was to develop knowledge. In University 3.0 the application of knowledge through innovation is the central mission. At Skoltech, we were not only building a new university but a *new kind of university.*

Our goals are to eventually approach the world’s best universities in academic

performance, and stand among the *most economically impactful universities in the world*. In the twenty-first century, we believe that universities will be measured on a two-dimensional scheme, in which traditional scholarly measures of impact are on one dimension, and economic impact is on the second. Leading universities have optimized the scholarly impact. However, economic impact is far from optimized, and a new entrant could, with hard work and focus, achieve a very strong position in this dimension.

Therefore, the mission is:

- To have fundamental educational, scholarly, and economic impact in the Russian Federation and around the world,
- By accelerating innovation: building integrated research/innovation programs to effectively meet the needs of industry and society, and educating graduate students to be leaders in translating knowledge from science to innovation,
- Using a fusion of exceptional Russian and international talent, key partnerships, and a world-class infrastructure, all embedded in the Skolkovo innovation ecosystem.

Research Programs

The key structure at Skoltech is the Center for Research, Education and Innovation (CREI). Within one organization, the three strands of the education, innovation, and research can be integrated. CREIs are focused on societal and industrial needs. There are no departments or schools at Skoltech. CREIs are deliberately overlapping, with fluid movement of faculty encouraged.

MIT advised closely on the creation of our CREIs:

- Design, Manufacturing and Materials
- Photonics and Quantum Materials Energy Systems (collaboratively with MIT)
- Electrochemical Energy Storage (collaboratively with MIT)

- Hydrocarbon Recovery
- Data-Intensive Biomedicine and Biotechnology
- Functional Genomics (collaboratively with MIT)
- Computation and Data Intensive Science and Engineering
- Space
- Advanced Mathematics

Educational Programs

Skoltech runs on four two-month terms, plus the January Independent Studies Period (the original name of IAP). The graduate education is at two levels, aligned with the two upper cycles of the Bologna

The CEI runs programs on: building effective *Networks* to the Skolkovo innovation ecosystem; funding *Translational Research* to accelerate ideas to impact; managing *Knowledge Exchange* at the interface; and operation *Education* programs to teach students the knowledge and skills of E&I.

A unique feature of the Skoltech education in E&I is that in the first month after the students arrive they participate in an all-consuming Innovation workshop. The main learning activities are experiential – in their first month students identify needs, select a technology, and sketch out a plan for commercialization. The princi-



First Entering Skoltech Class

model – Masters and PhD. Skoltech currently offers five Masters Programs (Energy Science and Technology, Information Technology Science and Technology, Biomedical Technology and Science, Space Science and Technology, and Product Design, Advanced Manufacturing and Materials). Skoltech uses the European Credit Transfer System (ECTS), and English is the language of instruction, supporting educational mobility, especially with the EU.

Innovation Programs

Innovation is the defining activity of Skoltech. The main organization for innovation is the Center for Entrepreneurship and Innovation (CEI) that contains all of the functions that at MIT are distributed throughout Deshpande, ILP, TLO, VMS, and the Innovation Initiative.

pal outcome is attitudinal: it changes them very rapidly from a passive student to a proto-entrepreneur.

Faculty and Students

Arguably the greatest contribution of MIT was in recruiting the first cadre of faculty and students. For the first three years, all faculty candidates were screened by MIT-led committees and interviewed at MIT. Many Skoltech students took terms at MIT, and the application pool was enriched by opportunity to study at MIT.

As of June 2016, we had attracted about 75 professors to the Skoltech faculty – of a long-term goal of 200. About 20% worked in Russia when hired, and 80% from abroad. However, this 80% included many members of the Russian academic

continued on next page

Skoltech

Crawley, from preceding page

diaspora. The graduate student population has a goal of 1200, and had reached the mid 400s. It contains about 20% true international students, broadly recruited from around the world.

Facilities – Interim and Long Term

Skoltech has worked in two sets of interim buildings (rental space in the Skolkovo business school, and then in the Technopark office complex). In the fall of 2017, Skoltech will move into its permanent campus (the equivalent MIT moving in 1916 – no ceremony with an ark is planned but drones may have a role).

The campus under construction will become a benchmark for university buildings. A circular ring surrounds interconnecting laboratory buildings, producing a 1,400,000 square foot academic campus – about the size of CalTech. The plan was developed by Pritzger Prize winning architects Herzog and DeMuron, and the labs designed by Payette of Boston (see figure).

Political Support

Despite the political and economic tensions within Russia and internationally, Skoltech continues to maintain strong political and financial support from the government. Diplomats in Moscow took the position that there are certain areas in which countries should continue to cooperate even when political tensions rise: culture, sport, science, and education are high on this list. In fact, two of our strongest supporters in Moscow were the U.S. and EU ambassadors.

What MIT Contributed

The contribution of MIT to Skoltech is enormous. First there is the brand: when I walked into any office in the world I was immediately viewed as the President of an MIT partner institution. The involvement in hiring was crucial, and in developing the culture of the first cadre of students. Function by function, MIT established the framework for the new university – edu-

cation, research, innovation, organization, and policy. The impact of MIT on the design of the campus was very significant as well.

- MIT should recognize its finite capacity of senior experienced faculty, the impact of the short-term loss of these folks from campus, and the downside influence on brand if the venture is not successful.



Skoltech's 1,400,000 Square Foot Academic Campus

What MIT Should Learn

Along with the Singapore-MIT Alliance for Research and Technology, Skoltech is the major international institution-building program of MIT of the last two decades. It is complemented by a range of smaller programs, including the Cambridge-MIT Institute, Masdar, Portugal, and others. I led two of these efforts. I think that MIT should learn from these efforts:

- MIT should fundamentally reconsider if its current model of institution building as a partner, but without long-term ownership or franchise, is optimal in the long haul;
- If MIT is to continue in the current model, it should develop a system that learns organizationally from one project to another, develops faculty with prescriptive knowledge of the MIT model, who are facilitated by a strong professional staff;

What Life Was Like For Me

Professionally, this was a unique experience. Day-by-day, it was damn tough. Month-by-month there was continuous positive progress. Personally, I had a wonderful time. Moscow is a great city. I enjoyed the classical culture, made good friends, joined the new Jack Nicklaus-designed golf club, and dined at many excellent restaurants (the best part of being a university president is that you never have to eat at home).

Closing

I would like to thank the hundreds of MIT folks who helped build Skoltech. It was not always easy, but important things seldom are. Our influence will be long lasting and significant. ■

Ed Crawley is a Ford Professor of Engineering and Professor of Aeronautics and Astronautics. He was recently awarded the Order of Friendship by the Russian Government, and elected to the Russian Academy of Science (crawley@mit.edu).

Do you have unreleased software projects you'd like to clean up and release as open source, but don't have time? Or maybe you uploaded a code dump to GitHub, but no one noticed it?

This spring's 6.S194 *Open Source Entrepreneurship* class can provide you with an opportunity to get your open source project going. We are looking for groups with unreleased or undeveloped software projects with potential. Student groups will develop your code dumps into useful open source projects through the entire project lifecycle, from requirements collection through coding to documentation and community outreach. This is an opportunity to convert "research-quality" tools and systems into practical, documented, and helpful open source projects. You need to provide a mentor (a graduate student or a post-doc) to meet weekly with the students developing your project to bootstrap project-specific knowledge and set goals. Your UROPs who are willing to take the class and work on your project are also welcomed.

Interested groups should contact Saman Amarasinghe saman@mit.edu and Jeffrey Bosboom jbosboom@csail.mit.edu with a brief description of the project's current state and goals and the name and contact information of the mentor.

Spread the Joy of Giving This Holiday Season

Laura Anca Chichisan



THIS NOVEMBER AND DECEMBER, faculty can brighten the holiday season for families experiencing poverty through the MIT Giving Tree program. Led by the Priscilla King Gray Public Service Center, the program partners with nonprofits that serve our neighboring communities. Since 1992, MIT faculty, staff, and students have donated hundreds of gifts for local families each year. Just last year, we collected and delivered an unprecedented number of presents: more than 900 items were donated to families and individuals.

How to Participate

This year, we hope to top last year's record by collecting more than 1000 gifts. Help us reach our goal by:

- Picking up a gift tag of your choice between Monday, November 21 and Friday, December 2. The tag will include recipient information and the name of the sponsoring agency.
- Purchasing the gift designated on your tag. The gift price range should be \$15 – \$25.
- Dropping off your gift no later than Friday, December 9.

Gift tag pick-up and gift drop-off locations are in the Stratton Student Center (W20) on the 5th floor and MIT Memorial Lobby (Building 10).

The PKG Center partners with local community organizations that are dedicated to serving low-income families and children, fostering education, and helping individuals facing homelessness. For this year's drive, our partners are Bridge Over Troubled Water, Cambridge Family and Children's Services, Cradles to Crayons, DCF Kids Fund, East End House, Elizabeth Peabody House, Project Hope, the Margaret Fuller Neighborhood House, Nurtury, Room to Grow, and The Guidance Center.

Help us support our neighbors. Together, we can bring a little joy and kindness to families facing poverty.

For more information about the program, visit: studentlife.mit.edu/pkg-center/givingtree.

Laura Anca Chichisan is the Communications Coordinator, Priscilla King Gray Public Service Center (clauraa@mit.edu).

In Memoriam Susan L. Lindquist



Susan L. Lindquist

The following Memorial Resolution was introduced by Professor David Page and passed unanimously at the Institute Faculty Meeting on November 16, 2016.

IT IS WITH DEEP SADNESS that we record here a memorial resolution marking the passing of Professor Susan L. Lindquist, our valued colleague, collaborator, and friend. Sue passed away on Thursday, October 27, 2016 at the age of 67. A risk-taker and an innovator, Sue's nearly 40-year career was defined by intellectually courageous, boundary-defying research and a passion for nurturing new generations of scientific talent. She believed that if we were not reaching for things beyond our grasp, we were not doing our job as researchers; if we were not constantly striving for that which we could only imagine, we were not fulfilling our obligations to society as scientists.

Sue had been on the faculty of MIT's Department of Biology since 2001, the year in which she was appointed Director of Whitehead Institute – becoming one of the first women in the nation to lead a major independent research organization.

In 2004, she resumed her research focus as an Institute Member and a Howard Hughes Medical Institute Investigator, as well as an associate member of the Broad Institute and the Koch Institute. Sue was a Professor at the University of Chicago for 23 years prior to coming to Whitehead and MIT. Before joining the Chicago faculty, she earned an undergraduate degree in microbiology from the University of Illinois at Urbana-Champaign and a PhD in biology from Harvard University.

Sue was a highly creative, out-of-the-box scientific thinker who possessed a unique biological intuition for the way things worked and the right questions to ask. She made numerous, invaluable contributions to the study of protein folding, demonstrating that alternative protein conformations can have profound and unexpected influences. In particular, her research transformed budding yeast into a model organism for studying human disease, evolution, and biomaterials. She was best known for her work on prions – proteins that exhibit an unusual ability to exist in multiple stable structural states, with altered functions depending on the state. Using yeast, she and her colleagues demonstrated that prions have the capacity to drive change in an organism's inherited characteristics without changing its DNA or RNA – relying instead on an ability to change how proteins fold. In a seminal breakthrough in evolutionary biology, her laboratory showed that prions can help activate many previously hidden biophysical interactions, producing new traits that are passed on to subsequent generations. In other words, by uncovering previously hidden genetic

variation that can help cells survive changes in their environment, prions provide a mechanism for the evolution of beneficial new traits.

One of the nation's most lauded scientists, Sue received the President's National Medal of Science, as well as the Dickson Prize in Medicine, the Otto-Warburg Prize, the Genetics Society of America Medal, the Vanderbilt Prize for Women's Excellence in Science and Mentorship, and many other awards. She was elected as a member of the National Academy of Sciences, the National Academy of Medicine, the American Philosophical Society, the American Academy of Arts and Sciences, and the British Royal Society.

Sue was not only a superb basic scientist, but also a caring and committed mentor, an extraordinary role model for women in science, a generous colleague, and a supportive friend. We remember her loving and generous personality, her humor, her creative spirit and her tango dancing at the Whitehead Institute's annual retreats. She is survived by her beloved tango partner and husband, Edward Buckbee; their two daughters, Nora and Alana; and her two brothers. Our thoughts are with them – and with the members of her lab, who she treated as family.

For these reasons, and in recognition of how much Sue meant to us, professionally and personally: Be it resolved that the Faculty of the Massachusetts Institute of Technology, at its meeting of November 16, 2016, records its profound sense of loss on the death of our beloved friend and colleague, Susan Lindquist, and expresses its deepest sympathy to her family, her colleagues, and her friends throughout the science community. ■

In Memoriam George Rathjens

James Walsh



George Rathjens

I FIRST MET GEORGE RATHJENS, who recently died at the age of 90, when I was thinking about applying to MIT's Defense and Arms Control Studies (DACS) program for graduate school. Little did I know then that this overly tall chemist with a jungle of an office would be my dissertation chair, advocate, squash partner, and inspiration.

By the time I reached DACS, now the Security Studies Program (SSP), George had already accomplished more than his new graduate student could hope to achieve in his entire career. The Fairbanks, Alaska native travelled east to attend college at Yale and then back to the West for a PhD at the University of California at Berkeley. He entered government in the Eisenhower administration with his mentor, George Kistiakowsky, who had been appointed Science Adviser. For the next many years, George continued his service to the U.S. government with a focus on nuclear weapons, including the Advanced Research Projects Agency (ARPA), the Weapons Evaluation Group at the Department of Defense, the U.S. Arms Control and Disarmament Agency (ACDA), and the Department of State.

Following his government service, George made his way to MIT to help found the Defense and Arms Control Studies Program, along with his dear colleagues and friends Jack Ruina and Carl Kaysen. While at MIT, George attracted a devoted following of graduate students.

He also scared more than one of them. He was often direct and unafraid of arriving at and expressing unpleasant or unpopular conclusions. More than once, these conclusions – say about a graduate student's future prospects – were not always appreciated.

For most of us, however, George was a delight. He fit easily with MIT's scientific culture, a style of inquiry that was informal, non-hierarchical, and curious. If you were a first-year graduate student – even an undergraduate – and disagreed with him and made the better case, well then so be it. If anything, I think he most welcomed those moments.

George's writing typically focused on real-world problems and appeared in more accessible journals such as *Scientific American*. He wrote on a variety of topics, including nuclear power, arms races, and the intersection between the environment and conflict. Most recently, he was working with Ron Siegel on the subject of climate change. This latter project was quintessentially Rathjens, insofar as it arrived at a difficult conclusion no one wants to hear, namely, that we may have passed the point of no return.

Outside of MIT, he was a tireless advocate of peace and disarmament. From 1998 to 2002, he was General Secretary of the Pugwash Conferences on Science and World Affairs, winner of the Nobel Peace Prize. He also served as chair of the Council for a Livable World, chair of the Federation of American Scientists, and

was an active member of the American Academy of Arts and Sciences and its committee on international security.

As a friend and colleague, George had an irrepressible sense of humor, though expressed in a style so dry that one might miss it if not for the twinkle in his eye. I think he loved making mischief, intellectual and otherwise.

He was also a man of action. When I went out to visit him in Lexington during those last months, I made him re-tell the story of the time he was hiking with a group in South America and was set upon by robbers, one of whom was armed with a pistol. From his perch in the back of the group, he dove onto the gun-wielding assailant and knocked the weapon away (though, as he reported it, he actually tripped in the process and more or less fell on him). The two robbers ran off, and the day was saved.

In the last few years George was largely confined to his bed because of terrible back pain, but he nevertheless maintained his spirit and intellectual curiosity. On what would turn out to be my last visit, we agreed that when I returned next, I would bring a problem or project that we could work on together. I later decided that I would seek his counsel on the problem of North Korea, as frustrating and difficult a challenge as there is in the world today. Unfortunately for me and for the rest of us, I never got that chance. Still, it is hard to be too sad. His was a life well lived until the very, very end. He pursued it with integrity and authenticity and a sense of humor. One could only hope to do as well. ■

James Walsh is Senior Research Associate at the MIT Security Studies Program (j_walsh@mit.edu).

Evolution of Schools, Departments, and Centers at MIT

Thomas W. Eagar

IN THE MARCH/APRIL 2016 *Faculty Newsletter*, Professor Olivier de Weck wrote an excellent review of the birth, progress, and subsequent dismemberment of the Engineering Systems Division (ESD) ["MIT Engineering Systems Division R.I.P."]. As MIT President Chuck Vest said when it started, ESD "is the most important educational experiment MIT has undertaken in the previous 30 years." Now 15 years later, I estimate MIT invested \$50 million in ESD. Professor de Weck calls it a "successful experiment," as it was on many levels, but it ultimately was closed down and the parts are now scattered without any unifying structure remaining. There are broader lessons about the formation, growth, and success of MIT's organizational units to be taken from the ESD story.

For its first 80 years, MIT's administrative structure consisted of departments and Schools. It was not until the growth caused by World War II that research laboratories and centers began to proliferate. The number of Schools also expanded with the formation of the School of Humanities, Arts and Social Sciences after the war to broaden the education of the scientists and engineers who had done so much during the war years to impact society. The Sloan School was formed in 1952 as an expansion of the Department of Business and Industrial Development in the School of Engineering. [P.B. Cronin, *A Work in Progress*, MIT Press 2002.]

When MIT moved to Cambridge in 1916, "John Ripley Freeman proposed a radical design . . . that emphasized flexibil-

ity and sited departments in adjoining spaces instead of separate buildings." [D.G. Douglas, "The Move That Shaped MIT," *Technology Review*, May/June 2016, p.12-18.] Creation of Schools within MIT builds walls that may assist administrators, but generally stifles innovation. It requires huge sums of money to induce

engineering systems design and engineering management." One of our references was "Socio-Engineering," an address given by Norm Augustine in which he describes the increasing importance of external social, political, or economic factors in engineering design. [N.R. Augustine, *The Bridge*, Fall 1994, p.3-14.] Joel Moses was

For its first 80 years, MIT's administrative structure consisted of departments and Schools. It was not until the growth caused by World War II that research laboratories and centers began to proliferate.

Schools at MIT to collaborate with each other as effectively as in the departmental structure. Each School Dean is a sentinel, bound to protect budgets and turf from other Schools. So it was when Dean of Engineering Joel Moses appointed me in 1995 to chair a School of Engineering committee with a charge:

"Our system is not ideally matched to the hiring and promotion of faculty interested in certain Big E areas. How can we change our hiring and promotion policies and practices (including some reorganization of the School) to enable such faculty to flourish?"

Our report noted "Leadership in Engineering Education and Research requires that MIT have strengths in both the functional aspects of engineering science as well as the integrative aspects of

concerned that a bright young MIT mechanical engineer, Professor Karl Ulrich, had been denied tenure in the Sloan School. Karl represented a non-traditional faculty member who did not fit the traditional mold of either School, as evidenced by his failure to receive tenure. Dean Moses formed a committee to address the concern that a talented "Big E" engineer could not flourish at MIT. When another Department Head asked why Joel selected Tom Eagar to chair the committee, he responded "Only Eagar has the [guts] to do it."

There were a number of constraints that Joel gave us; the primary one that there was no money to implement any proposed changes. This was solved by creating Zero-based Faculty Budgeting (ZBFB) in which departments no longer held a fixed number of faculty slots. "ZBFB would require all unfilled or

released faculty positions to be returned to the Dean of Engineering each year for re-allotment to the Division (ESD) and the Departments.” I envisioned this transfer of power from the Department Heads to the Dean would be the hardest sell for our proposal. It turned out to be the easiest. The Department Heads recognized the flexibility this created in re-portioning the faculty among various departments over time.

A second, unarticulated constraint is that we could not use the “M” word. Personally, I believed that separating engineering management from engineering science in 1952 had been a mistake. Half a dozen prior committees over the previous 40 years had tried to bring back some of the educational richness that had left the School of Engineering when MIT created the Sloan School. Nonetheless, in my first draft of our proposal, I called for creation of a Division of Engineering Management. As expected, Tom Magnanti, the Sloan School representative on our committee went ballistic. In the second draft, I coined the title Engineering Systems Division with the intent that this would be a different focus than a Division of Engineering Systems. In hindsight, it would have been more accurate, more appropriate, and a firmer foundation for the future to use the first title; but that would have incited war between the Schools.

Our proposal was for an educational organization to provide subjects cutting across the eight departments of Engineering. Our Conclusion stated:

“This Committee has not presented any conclusions that have not been articulated previously by many of our colleagues. In order to remain preeminent in Engineering Education and Research it is essential that the School of Engineering develop faculty with a diverse range of interests. The leaders of the School of Engineering continue to believe that we need to attract and retain a larger number of faculty with interests in Big E engineering. We propose a divisional structure to accomplish this objective while

requiring that these faculty remain committed to the educational programs of the individual Departments.”

We recognized that the organizational structure we proposed would be useful in helping form new departments in the School of Engineering or helping a department become absorbed into existing departments.

Soon after ESD was announced as a School of Engineering initiative, faculty from the Sloan School and SHASS asked to participate. We knew our mission cut across those Schools and we were gratified with the response.

“While the Committee has developed this organization proposal as a means of hiring, nurturing and retaining Big E engineering faculty, this organizational structure (or a similar one) may be useful in a number of other contexts. For example, programs cutting across Schools might benefit from a similar organizational academic structure. We believe that this framework can provide flexibility across the Institute as well as across the School of Engineering.”

In fact, Professor Doug Lauffenberger, a member of our committee, was the first to use the proposal to form the Division of Bioengineering, which has since grown into the Department of Bioengineering.

The fact that ESD might appeal to faculty beyond the School of Engineering was not lost upon us, but we knew that it would be easier to start solely within the School of Engineering, rather than spend years negotiating between Schools. The proposal to form ESD was sold to the other seven Department Heads as an educational mission. Bob Brown was now the Dean of Engineering and Joel Moses was Provost. Dean Brown left the marketing to me because of the risk involved. I told the other Department Heads that MIT did not need

a new organizational structure to foster research; we already had enough laboratories and centers that did that. We did need educational subjects that cut across the departments; subjects that no one department could support as a service to the other seven; that the Sloan School was restricting enrollment of our students from subjects central to their future profession, etc. ZBFB would provide the necessary faculty slots in a flexible and equitable

manner and the departments would get broad-based integrative engineering economics, policy, and management subjects in return. Six of the seven other departments bought into the proposal.

Now that Dean Brown could see the direction of the wind, he supported the proposal.

Soon after ESD was announced as a School of Engineering initiative, faculty from the Sloan School and SHASS asked to participate. We knew our mission cut across those Schools and we were gratified with the response. After placating the Deans from the other Schools who were protecting their turf, ESD soon became an Institute-wide initiative, albeit centered in the School of Engineering.

So why did an educational program with such broad support fail? There are multiple reasons.

1. **Lack of a unified mission.** ESD was sold to the departments as an educational program that would “give-back” unified Big E engineering subjects. In the first five years, ESD could only count two or three new offerings (several by myself and one by Joe Sussman) that would not have existed without ESD. During ESD faculty

continued on next page

Evolution of Schools/Centers at MIT
Eagar, from preceding page

meetings in those years, I would repeatedly remind the faculty of the educational imperative of ESD.

In one Endicott House ESD retreat, defining ESD objectives for the future, Paul Lagace and I were in a break-out session that concluded that our educational mission should be the first priority. After reporting this conclusion back to the faculty as a whole, Dan Roos, then head of ESD, stated he “did not think education should be the first priority or even in our top three or four.” Sitting in the back, I quietly arose, walked out, and never returned to ESD.

Reflecting on the drive home, I realized it had been a mistake to place someone who took some pride in not having taught a lecture subject for 15 or 20 years, in charge of an educational program.

What I learned some years later from Yossi Sheffi, was that Dean Brown had secretly redefined the ESD Mission. Yossi told me that shortly after the announcement of the formation of ESD, Dean Brown held a closed meeting with selected ESD faculty to tell them that ESD was not to involve undergraduates and was not to focus on education. Only then did I understand why my reminders of the educational mission of ESD were falling on so many deaf ears.

2. The departments failed to receive the promised benefits from ESD. The

departments were asked to share faculty slots with ESD in exchange for a broader and more diverse curriculum that each alone did not have the resources to provide. Dissatisfaction arose each year as the departments did not receive the proposed benefit.

Professor de Weck listed “Clarity of Mission” as one of his lessons and take-aways in his eulogy for ESD. I concur, but from a different perspective. The initial mission was clear but a few early administrators and leaders failed to fulfill, and I believe had no intent to fulfill, the pledges made to the departments that had agreed to sacrifice for ESD. Unfortunately, it is a tale that is being repeated at frequent intervals within MIT today. The faculty are promised benefits from aligning ourselves with an entity that will provide tremendous resources but when the resources arrive, they are maldistributed. While ESD was told at the outset that no money was available, but that a student and faculty need existed, an organizational framework was created to address the need. The Department of Bioengineering is proof that the organizational framework can succeed. In the case of ESD, the Division’s mission was hijacked by half a dozen faculty who used ESD as their personal sandbox. As Professor de Weck noted, some faculty recognized the educational imperative of ESD, while others claimed to be in search of a grand unified theory of socio-technical systems.

Generalizing from this, creation of new departments, Schools, laboratories, or centers should have a clearly defined mission with measurable objectives, and the promised resources should be distributed to those who are asked to make the sacrifices. In fact, ESD had a clear educational mission, yet the administrators in charge had no interest in fulfilling the promises. Millions of dollars were wasted along with decades of faculty effort. In the end, the greatest losers have been the students who have to search harder for the education that nearly everyone agrees they need.

In the past 40 years, MIT has established numerous laboratories and centers. Some address important national or international needs. Some are opportunistic ways to secure large amounts of funding. A few provide a way to placate a powerful faculty member who is seeking to expand his influence. Whatever the reason for creating a new entity, the mission, the deliverables, and the timeframe should be put in writing and publically disseminated. Backroom secret reorganizations should not be permitted. Such deals do a disservice to all faculty and students. The five-year review committee should measure what we have gotten against what we were promised. ■

Thomas W. Eagar is a Professor of Materials Engineering and Engineering Management (tweagar@mit.edu).

An Institute-Wide Festival of Learning

Sanjay Sarma

MIT'S SUSTAINED COMMITMENT to teaching and learning is widely recognized. Combined with its pioneering role in fostering educational innovation, MIT is transforming instructional practices both within the Institute as well as nationally and globally.

Part of MIT's strength is the diversity of activities in this area: not only those that directly impact students and classroom instruction, but also research-based initiatives focused on fundamental pedagogical change. To bring these endeavors to the next level, the Office of Digital Learning (ODL) is gathering together an Institute-wide event to highlight the exciting work underway in these areas. Closely collaborating with the Teaching and

Learning Lab, as well as working with co-sponsors DUE (Dean of Undergraduate Education) and ODGE (Office of the Dean of Graduate Education), ODL will engage the broader MIT community to celebrate and explore education innovation, as well as to provide a forum for knowledge transfer and idea generation.

Activities

The Festival of Learning will include a roster of activities targeted to specific groups such as lightning round teaching innovation sessions featuring MIT faculty innovators; a "learning/think/hack-a-thon" challenging students to create tools that address and solve major problems in online instruction; an Innovation Fair

that engages the broader spectrum of individuals, departments, and initiatives in this area, as well as other events for faculty, students, and the MIT community as a whole.

Taking place over two days towards the end of IAP (February 1st & 2nd) the Festival will demonstrate the catalyzing power behind initiatives which are transforming the way we look at education and revolutionizing the way we teach and learn.

For an evolving overview of activities, program agenda, and events during the Festival, please visit: odl.mit.edu/festival-learning-2017. ■

Sanjay Sarma is Vice President for Open Learning (sesarma@mit.edu).

The Alumni Class Funds Seek Proposals for Teaching and Education Enhancements

THE OFFICE OF THE DEAN for Undergraduate Education is requesting proposals for projects for the 2017-2018 academic year that improve the quality of teaching, enrich students' learning experiences, and uphold the tradition of innovation at the Institute. The Alumni Class Funds are comprised of gifts from the classes of 1951, 1955, 1972, and 1999.

Over the past 20 years more than 200 projects were made possible through the

generous assistance of The Alumni Class Funds. These projects have had substantial impact on education both inside and outside MIT. Grants typically range from \$10,000 to \$50,000 and cover a wide variety of creative curricular and pedagogical projects. Larger scale projects will also be considered, as well as project renewals and multiple year projects, but funding commitments will be made on a year-by-year basis.

Proposals are due on Friday, February 3, 2017. Guidelines, forms, instructions, and descriptions of previously funded projects can be found at: web.mit.edu/alumnifunds.

Please contact the Curriculum and Faculty Support team in the Registrar's Office at 617-253-6776 or alumnifunds@mit.edu for more information. ■

letters

!!!Retired Faculty Alert!!!

To The Faculty Newsletter:

WHEN I RECENTLY ATTEMPTED to renew my annual membership and locker fee at the DAPER desk, I was told it would cost over \$800. As that was considerably more than what I paid last year, I asked why. They said that was the fee for “Affiliates.” When I said that I wasn’t an affiliate but a professor emeritus, they showed me the “Affiliate” indication on my ID card.

I then went to the ID desk in the Student Center and asked what was going on. They told me to obtain confirmation about my emeritus status from the Human Resources staff person in the office. He confirmed my emeritus status to an ID staff member, who said that they usually gave retirees “Affiliate” ID cards, and that once a card specifies a status it can’t be changed. (I had lost my ID card last year and the new one contained the “Affiliate” designation, a change I didn’t notice.)

I explained the difference in DAPER membership fees. The ID staff person then agreed to change my card.

DAPER subsequently charged me what I’d paid the previous year.

So, if you’re retired, examine your MIT ID card. If it indicates “Affiliate” you may be paying more for MIT services than you need to.

Jean Jackson

Professor Emeritus, Anthropology

letters

Improving Institute Faculty Meetings

To The Faculty Newsletter:

BRAVO TO PATRICK WINSTON for speaking out in the *Faculty Newsletter* to make the faculty meetings more truly engaging for the members (“Does MIT Really Need a Faculty Senate?” *MIT Faculty Newsletter*, Vol. XXVIII, No. 4).

Over the half-century that I have watched these meetings I have noticed the erosion of the faculty meetings as a place where communal issues were once comfortably raised and a sense of real participation in the governance of the Institute was the norm. I have wondered when someone would speak up.

I trace the lack of attendance to a growing sense that everything that mat-

tered was already decided and that the opportunity to speak without fear of retribution or at least disregard was the norm. The desire for administrative convenience and a patronizing sense that those in charge know best has done real damage to the sense of loyalty and civic responsibility that faculty used to display in abundance.

Perhaps those days were a reflection of the wartime and post war sense of shared mission and communal commitment to MIT. Much of that seems to have diminished. Perhaps the present administration would profit from remembering how that sense of common purpose and loyalty proved to be so valuable during the painful days of the late ’60s when the Institute was under siege. I remember one night stand-

ing at the barricade in Building 20 with Ray Weiss and other faculty members when ROTC was under attack. The conversation both between faculty and others on one side of the barrier and the concerned students on the other side was a testimony to how powerful the sense of community was when confronted with such challenges and how effective an engaged faculty were in making a learning moment out of what could have been a wound that would have lingered.

I hope your proposals are pursued and congratulate you on putting them forward.

Bob Simha

Research Affiliate

letters

On Gender Differences in Submitting Admissions Maker Portfolios

To *The Faculty Newsletter*:

I JUST READ “Gender Imbalance in MIT Admissions Maker Portfolios” (*MIT Faculty Newsletter*, Vol. XXVIII, No. 2). I’m not sure of the actual application rate for men versus women at MIT, but the numbers in the chart seem to indicate 12,750 and 5,556 respectively for year 2013. I find on another Website that 46% of your undergraduates are women, which if correct implies that the women applying have a much higher probability of gaining admission. A rough calculation

says the odds are 1 in 10 versus 1 in 20 for men. So male applicants in my opinion would be much more inclined to submit a Maker Portfolio because they don’t want to leave any stone unturned in their quest for admittance.

Of course, that doesn’t explain the total difference in disparity between the male/female Maker Portfolio submittal rate, but it could be the reason for some of it.

Mark Noga
markn@lmsal.com

Chris Peterson and Hal Abelson respond:

We thank Mr. Noga for his comment. However, his hypothesis does not account for the significant gap between the rate at which women submit Maker Portfolios and that at which they submit other kinds of portfolios (e.g., art and music), which is the primary phenomenon we are seeking to explain, especially in the context of contemporary initiatives to engage women in STEM.

letters

Keep Up the Good Work

To *The Faculty Newsletter*:

THANK YOU FOR YOUR continuing excellent work and service.

I just finished reading a few articles in the most recent September/October 2016 issue and I just simply wanted to share some personal feelings that your newsletter has generated. I felt truly inspired to do even more not just for MIT but for the entire world while reading your “Global

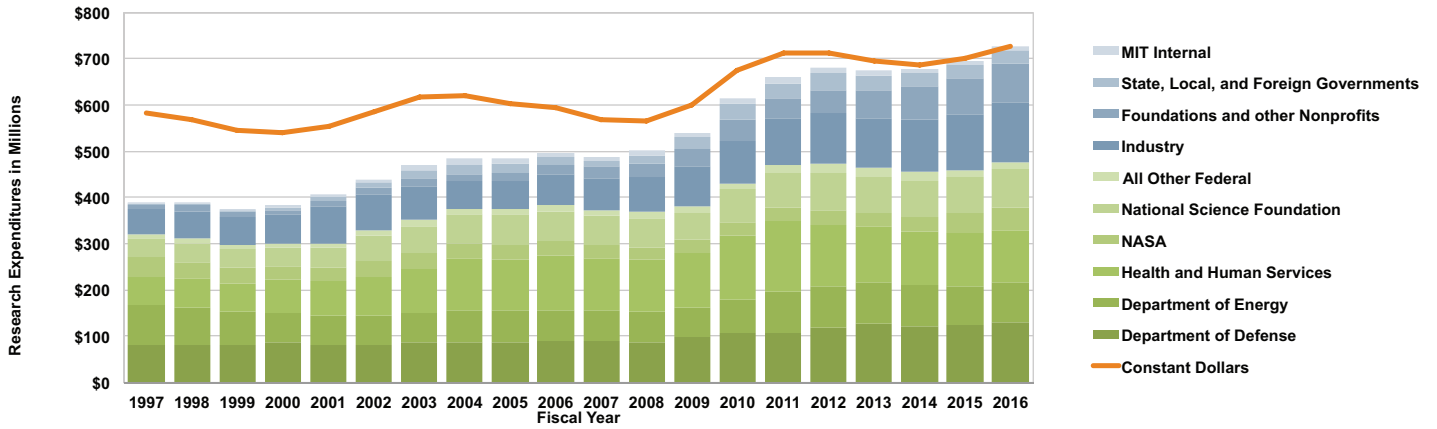
MIT” article. I felt informed and made aware of important issues about life and work at MIT reading the Faculty Quality of Life survey article. And good or useful feelings like that are reoccurring every time I read articles from your newsletter. It has been my number one regular reading for the past many years. And having experienced many good things going away just because people are more inclined to complain about bad things

and never take the time to confirm support for things that do work: let me take a positive action and not write because of a complaint . . . but rather just to say thanks again for making us all feel part of a community.

Luca Daniel
Professor of Electrical Engineering
and Computer Science

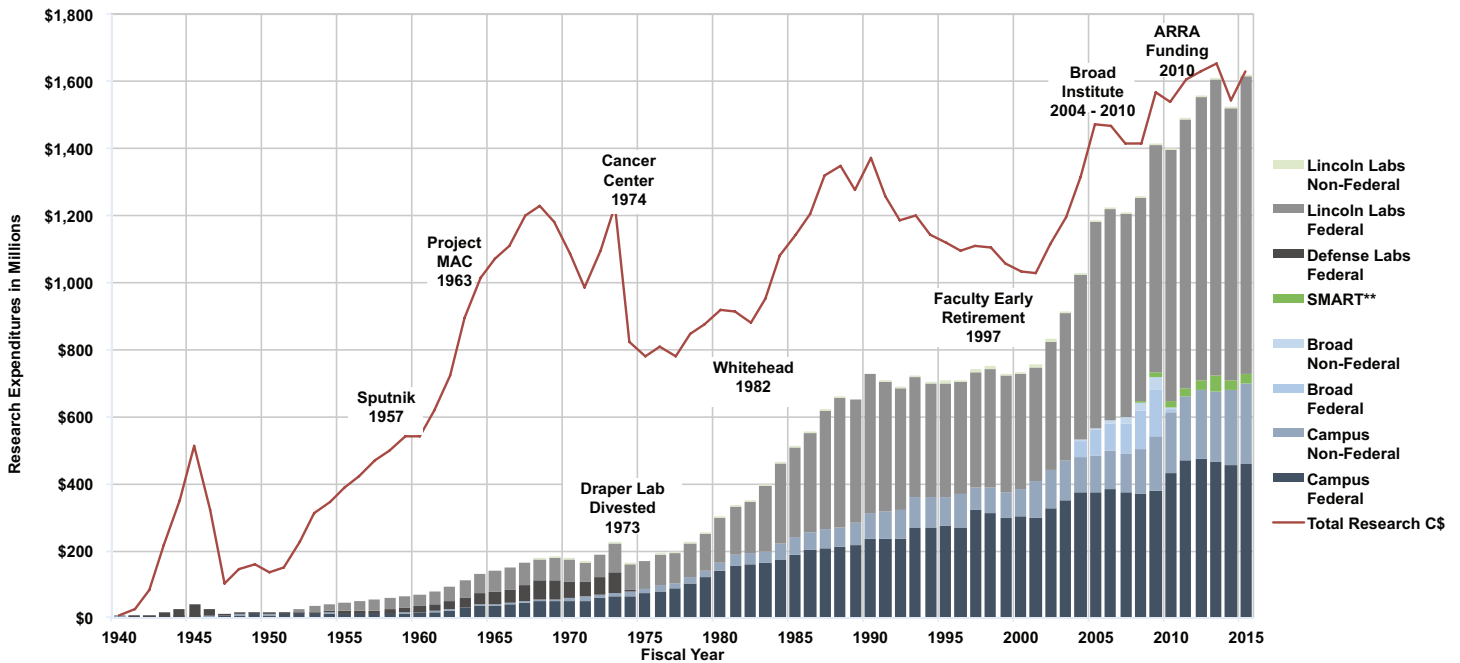
M.I.T. Numbers

Campus Research Expenditures* FY 1997–2016



*Campus-based Broad Institute research expenditures are excluded.
Constant dollars are calculated using the Consumer Price Index for all Urban Consumers weighted with the fiscal year 2016 equaling 100.

MIT Research Expenditures FY 1940–2015



**SMART: Singapore-MIT Alliance for Research and Technology
Total Research constant dollars are calculated using the Consumer Price Index for all Urban Consumers weighted with the fiscal year 2015 equaling 100.

Source: Office of the Provost/Institutional Research