Massachusetts Institute of Technology

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MIT Faculty Newsletter

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in this issue we offer guidelines for the upcoming presidential search (editorial, below); commentary on the graduate student union organizing campaign (page 5); a proposal for MIT's educational mission based on Open edX (page 10); and a solution to the problem of distracted driving (page 15).

Students Working in the Lab

Scholarly Publisher Contracts and New Benefits for MIT Authors

Roger Levy and Chris Bourg

MIT HAS BEEN USING THE Framework for Publisher Contracts to guide negotiations with scholarly publishers for more than two years. This principles-based framework aims to support the needs of scholars, reflect Institute values, and advance scholarship. In a short period of time, MIT has used the framework to reach several agreements with publishers that demonstrate the viability of our approach. We encourage MIT scholars to take advantage of the open access publishing benefits of these agreements.

Toward Equitable and Open Publishing

The Committee on the Library System (CLS), the Ad Hoc Task Force on Open Access to MIT's Research, and the MIT Libraries jointly developed the

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An Update on Research Administration

Maria T. Zuber and Krystyn J. Van Vliet

OVER THE YEARS, TWO overarching trends have added to the research administration complexity faced by principal investigators at MIT.

First, the fraction of research funding that comes from non-federal sources, including industry and private foundations, has increased substantially, today accounting for approximately 40% of our campus research volume. Second, research agreements themselves, federal and non-federal alike, have grown more complex, due to a range of factors such as new compliance, data privacy, and disclosure requirements.

Many principal investigators (PIs) at MIT now manage *more diverse research portfolios* composed of *more complex individual agreements*. In light of these changes, and to better support PIs, in fall 2019 MIT announced an effort to trans-

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Editorial

Selecting a New President

IN ITS 156 YEARS, MIT will begin selecting a new president for the nineteenth time. The MIT Corporation will make the selection informed by the recommendation of a Search Committee. We hope committee membership will include those who drive excellence at MIT: faculty, staff, researchers, post-docs, undergraduate, and graduate students.

Irrespective of the committee's composition, the broader MIT community needs to know the answers to two questions. First, how will the committee present the leadership needs for MIT?; and what considerations will be at the heart of the committee's deliberations?

MIT's fundraising campaign, "Make A Better World", has helped it grow into a massive research, innovation, and educational enterprise. In the push to develop a 27.4 billion dollar endowment, too often

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Address
MIT Faculty Newsletter
Bldg. 10-335
Cambridge, MA 02139

Website
https://fnl.mit.edu

Telephone 617-253-7303
Fax 617-253-0458
Email fnl@mit.edu

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Selecting a New President
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consideration of what is fair, justice, equitable, or moral has, at best, gone unexamined and, at worst, been ignored. Yes, at times, MIT leadership demonstrates moral courage as evidenced in the decision to retain service staff during the Covid shutdown or defending Professor Gang Chen. Some members of our community would include the decision to stop the Skoltech program in response to Russia's invasion of Ukraine as another sign of MIT's moral courage. While it was the correct action, it reveals a moral relativism that is too often used to secure or allocate resources.

MIT should have never undertaken the Skoltech program. It is unclear to most campus stakeholders how providing Russia a research center that helps it gain access to shale and oil reserves in the Arctic and undermining any rhetoric about managing climate change at home will "Make a Better World." There are many unanswered questions about why a Russian oligarch was included as a member of MIT's Board of Trustees and why he was removed – clearly there needs to be more transparency and accountability by the MIT President and other leaders towards the MIT community. Moreover, pursuing the Skoltech relationship would eventually place MIT researchers and students in a compromised position.

Similarly, the welcoming of Saudi dictator Mohammed bin Salman, the acceptance of donations from Jeffrey Epstein, the questionable housing practice of Stephen Schwarzman's Blackstone Group, and similar missteps lead to MIT jeopardizing its moral standing and core educational mission in the world. Moreover, it is unclear how the world of graduate students is made better when MIT's development arm, MITIMCo, uses the East Campus triangle to build new commercial office buildings instead of desperately needed graduate student housing. As a result, the ethical leadership of MIT is compromised.

The new president must have the skill, knowledge, and expertise to help MIT find a new moral center.

One possible way to assess that capacity is to provide the Search Committee with a candid view into the varied perceptions of faculty on the following questions about MIT:

- What has been created that should be strengthened?
- What has faltered and needs shoring up?
- What has been neglected and needs attention?
- What have we held onto that is holding us back?

Such a process would use faculty intelligence; it would also help the prospective candidates understand the climate and challenges as seen by those who make up the Institute.

What MIT excels at is by itself insufficient to solve the world's problems. Thus, in our pursuit for excellence, we should at least be guided by the simple phrase "Do No Harm." We need a deep look at how we act in the world to do that. So, in finding a new leader, let us look for someone who can help us "do no harm" as we excel in what we do best.

Editorial Subcommittee

Scholarly Publisher Contracts and New Benefits for MIT Authors
Levy and Bourg, from page 1

Framework in 2019, incorporating feedback from School council meetings and input from external experts. In January 2020, members of the Deans' Group affirmed support for the Libraries adhering to the Framework in negotiations with publishers, and recently reaffirmed that commitment in November 2021. Additionally, nearly 200 libraries, at institutions ranging from large research universities to liberal arts colleges, have endorsed it.

The Framework is rooted in an overarching principle:

MIT recognizes that the value in published scholarship originates in the labor of authors, peer reviewers, and editors, and the institutions that support them. The benefits to society are greatest when this scholarship is freely and immediately available to the entire world to access, read, and use; without restriction and for any lawful purpose. (MIT Framework for Publisher Contracts)

While fair and sustainable costs are a key element to Framework-aligned contracts, our negotiations with publishers are not guided solely by finances. In keeping with MIT's mission, the Framework creates a mechanism for ensuring scholarly research outputs are openly and equitably available to the broadest and most inclusive audience possible. It also reflects our belief that an equitable opportunity to contribute to scholarly literature is as important for the integrity and usefulness of scholarship as is the open accessibility to read.

The MIT Framework Elements

Successful, Framework-aligned agreements make progress toward three goals: 1) terms aligned with MIT's mission, principles, and policies; 2) terms that represent a fair and sustainable price for the value-added services provided by publishers; and 3) terms that preserve and protect scholars' and scholarly communities' control over their own intellectual output.

The core elements of Framework-aligned contracts include:

- No requirement to waive MIT Open Access policy
- No requirement to relinquish copyright; generous reuse rights
- Direct deposit in MIT's open repository (DSpace@MIT)
- Computational access to subscribed content
- Long-term preservation commitment
- Institutions pay for value-added services

The MIT Framework in Action: Benefits to MIT Authors

The principles of the Framework translate to immediate benefits for Institute authors. As a result of these recent agreements, the Libraries will pay the majority of our authors' publications costs. MIT corresponding authors can now make articles with the following publishers freely and openly available upon publication, at no cost to them:

- Association for Computing Machinery (ACM)
- American Institute of Physics (AIP) Publishing
- Public Library of Science (PLOS)
- Royal Society of Chemistry
- Springer and Palgrave
- Wiley

Many of these agreements also include text and data mining permissions, automatic deposit into MIT's institutional repository, DSpace, and/or no requirement to waive MIT's Faculty Open Access Policy. For more information on these individual agreements, see the Libraries' Scholarly Publishing website, and contact *scholarlypub@mit.edu* with any questions.

Elsevier

Elsevier is the one major publisher that remains unwilling to produce a proposal for MIT that aligns with the Framework. Consequently, the Institute is out of contract with this publisher. In the meantime, alternative access to Elsevier's paywalled content is available. In response to concerns that turnaround times for some alternative access methods was not meeting research and teaching needs, the Libraries are implementing new document delivery services and technologies to significantly expedite access to recent content. We continue to pursue Framework-aligned contracts with all major publishers, including Elsevier.

Elsevier is the one major publisher that remains unwilling to produce a proposal for MIT that aligns with the Framework. Consequently, the Institute is out of contract with this publisher.

Looking Forward

Our success in negotiating Framework-aligned contracts with a diverse set of non-profit, society-based, and commercial publishers gives us confidence that adhering to the MIT Framework is an advantageous path forward for MIT, and for scholarly communications. To confirm the viability of this approach, we are gathering data about how effective these agreements prove in transforming scholarly communications into an open and equitable system, optimized for applying knowledge to the world's greatest challenges. MIT scholars who are interested in learning more about how they can support MIT's pursuit of open and equitable scholarship are encouraged to contact us at *rplevy@mit.edu* or *cbourg@mit.edu*.

Roger Levy is a Professor in the Department of Brain and Cognitive Sciences *(rplevy@mit.edu);* **Chris Bourg** is the Director of Libraries *(cbourg@mit.edu).*

Reflections on the MIT Graduate Student Union Organizing Campaign

Robert B. McKersie

FOR THOSE OF US TEACHING and researching industrial relations to have a union organizing campaign unfolding where we work is amazing and engaging. I have been at MIT since 1980 when I came to head the Industrial Relations Section (now the institute for Work and Employment Research) located in the Sloan School of Management.

Recently my colleagues authored a "white paper" emphasizing the importance of having the campaign take place in the spirit of a "laboratory" so that grad students can make their decision freely, without interference from their faculty supervisors or the MIT administration. Recently the administration has issued talking points for faculty. While the content is within the law, having faculty (who exercise considerable power regarding the careers of their grad students) counsel with their grad students may not honor the maxim: "Let the students decide."

How the union organizing effort is addressed by the administration and by the student leaders (should the union win) will shape the relationship going forward.

MIT has been late to join the list of top schools where collective bargaining has been certified for grad students (e.g., Yale, Brown, Columbia, and here in Boston, Tufts, Brandeis, and Harvard). A variety of national unions have been involved. Here the organizing committee chose the United Electrical Workers Union (UE).

Having an industrial union involved may seem strange, however a number of unions have established new divisions to concentrate on employees in the service sector. The UAW is the parent union for the graduate unit at Harvard. The UE is not your typical national union. It is not affiliated with the AFL-CIO. It prides itself on being progressive, taking positions on foreign policy and domestic issues, such as global warming. Over the years doing field work in the electrical industry and hearing arbitration cases I have met staff from this union and they are very professional and committed union leaders.

How the union organizing effort is addressed by the administration and by the student leaders (should the union win) will shape the relationship going forward.

The question can be asked: How much do they know about higher education? While they are part of organizing efforts at the University of Iowa and New Mexico State University they are not as involved with grad students as some other unions, such as the Service Employees International Union (SEIU). The caliber of the servicing reps is very important since grad student leaders "come and go" and the national organization plays an important role especially when contracts are negotiated.

I am sure that many in our community are wondering about the agenda that grad student unions bring to collective bargaining. Certainly, pay is primary and the unions have been able to increase hourly rates when grad students are employed as TAs and RAs. A major issue has also been insuring attention to harassment complaints. This is complicated since all universities have Title IX procedures in place and finding an accommodation between a union grievance procedure and the requirements of Title IX requires creative crafting of hybrid models.

The MIT administration has focused attention on the subject of dues mentioning that the annual cost could be as high as $550. This is ironic, since MIT like other universities would likely not agree to a "mandatory" dues arrangement covering everyone in the bargaining unit. Grad students have to opt in – and the result is that in some situations less than half of the students covered by collective bargaining regularly pay dues.

There are other important topics of concern to graduate students (such as graduate student housing) that MIT could agree to discuss but would likely prefer to continue with some variant of its present practice of having students on advisory committees. But I want to end with a call to have the period we are now in – leading up to the vote – be characterized by rational arguments re: the pros and cons of collective bargaining for our grad students and, if the union wins, for the process going forward to be a model of how a graduate student union can forge a positive relationship with the administration and contribute both to employee voice and organizational performance.

Robert B. McKersie is Professor Emeritus in the Sloan School of Management *(rmckersi@mit.edu).*

An Update on Research Administration
Zuber and Van Vliet, from page 1

form its research and sponsored activity enterprise.

In the coming months, on these pages, we plan to provide updates on our progress in enacting this transformation. Today, we offer a broad overview of what we're working to achieve, along with a brief status report. In future updates, we'll go into more detail about the issues we summarize here.

At its core, this transformation is about ensuring that researchers can spend as high a proportion of their time as possible on their research. It is also about ensuring that researchers have the support they need to successfully pursue appropriate funding opportunities, rather than pass them up because of concerns about excessive administrative burdens. Ideally, if we are successful, we should be able to say that our research administration enterprise satisfies the following four strategic imperatives:

First, it is built on a culture of PI service and mutual respect, providing researchers with more personal support and a clearer understanding of expectations, goals, and timelines. Second, it is agile – well-positioned to manage the increasing complexity of agreements and of researchers' funding portfolios. Third, it is viewed by PIs as a resource and respected partner, not a barrier. Fourth, it supports a seamless process from beginning to end – researchers don't have to serve as their own general contractors to ensure that grant applications or negotiations with a potential sponsor remain on track.

To build this kind of enterprise, our focus is on what we call the "two Ts": teams and tools.

Teams

A few years ago, when we were contemplating how to design this new enterprise, a faculty and staff committee proposed various options. These ranged from making modest changes to the former Office of Sponsored Programs, to a more complete overhaul – starting from a clean slate and mapping out the resources and functions that we believed were vital.

Ultimately, it was the latter, more comprehensive approach that we chose to pursue, based on a recognition that working with different types of sponsors requires teams with additional sets of skills and areas of expertise, including ones that we didn't yet have. Hence we created two new offices, Research Administration Services (RAS) and the Office of Strategic Alliances and Technology Transfer (OSATT).

At its core, this transformation is about ensuring that researchers can spend as high a proportion of their time as possible on their research. It is also about ensuring that researchers have the support they need to successfully pursue appropriate funding opportunities, rather than pass them up because of concerns about excessive administrative burdens.

RAS focuses primarily on grants and contracts with U.S. federal, state, local, and some nonprofit sponsors. Its professionals are experienced in managing the deadline-driven application processes of the federal government, the considerations when PIs are part of a multi-institution collaboration sponsored by the federal government, and staying current on federal agencies' rapidly evolving compliance and disclosure requirements. RAS also supports the important post-award phase when sponsored agreements connect funding to the MIT accounts that PIs use to support research team costs or when the PI seeks a no-cost extension from a federal sponsor.

OSATT focuses on agreements with industry, industry consortia, international sponsors, and – along with RAS – select nonprofits. Professionals in OSATT bring experience and expertise in supporting PIs who pursue new opportunities for external engagement and managing the risks that come with those opportunities, such as preserving the PI's right to publish research outcomes while also supporting any interest in pursuing commercialization. Many PIs at MIT work in highly collaborative environments (across other institutions or multiple sponsor types), which we consider a strength; but this also includes complexity for the PI. Here, OSATT supports the PI's role in being aware of and appropriately managing those implications.

The RAS and OSATT teams work closely with each other and with colleagues from other offices across the Institute, including the research compliance and systems and support teams in the Office of the Vice President for Research; Office of General Counsel; Office of the Vice President for Finance; Resource Development; and more.

With a PI service orientation, the objective is that professionals within RAS and OSATT support researchers by pulling in resources from other parts of the Institute, as needed. That's what we mean when we say that PIs should not have to be their own "general contractors." For this approach to succeed, we as faculty in our PI roles also need to engage staff colleagues in research administration roles with respect for their expertise and workload, just as we expect the same when seeking administrative services and support.

Additional critical partners are research and administrative staff in departments, labs, and centers, who have important responsibilities in research administration. Together, all stakeholders – PIs and staff members at both the Institute and local levels – contribute to the shared mission of submitting high-quality proposals, managing compliance

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An Update on Research Administration
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risks, and fostering productive external engagements.

Our objective here has been simply to give the lay of the land. In a future update, we'll describe in more detail how these new organizational structures are intended to improve the everyday experience of PIs.

Tools

The other one of our two "Ts" is *tools*. We need to work continuously to upgrade the tools available to support research and the administration of sponsored activities. An example is the recent launch of a new portal for requesting non-disclosure agreements (NDAs) and data use agreements (DUAs).

Rapid growth in the quantity and complexity of NDAs and DUAs has been a real pain point for faculty in recent years. Following several months of discussions with staff and faculty about how to simplify the processing of these agreements, OSATT launched the new portal in January 2022. It provides an easy way to stay updated on the status of requests *and* connect to the colleagues who facilitate these agreements.

An initiative for which planning is underway is the development of a new one-stop research dashboard. It will create a single access point to all information about research and sponsored activity for researchers and research administration teams, consolidating information that is stored in various existing systems at MIT. We will provide more details in a future update.

Progress

The pandemic caused a delay in executing the plan we laid out in 2019, but we are again making progress on both the *teams* and *tools* aspects of the plan.

In fiscal year 2021, despite the fact that RAS was forced to become a fully remote operation, its grants and contracts team reviewed and submitted a total of 3,344 proposals (down less than 1% from fiscal year 2020) and processed 1,145 new awards (down just 3% from fiscal 2021). In fiscal year 2022 to date, the numbers are up compared with the same period last year.

OSATT finalized over 250 research agreements with non-federal sponsors and over 700 other research-related agreements vital to individual PIs in fiscal year 2021. OSATT also took point in partnership with PIs and other MIT offices to successfully conclude a number of important new Institute-wide agreements with a range of companies such as Accenture, Amazon, and Takeda, as well as many School- or department-level agreements with organizations key to their research pursuits. To test new approaches in partnership with faculty and research administrators in DLCs, OSATT has also launched targeted programs over the past year. For example, partnership with the Department of Chemical Engineering this academic year has helped OSATT, RAS, and the DLC test and improve administration of industry-sponsored research for PIs.

We have also continued building the RAS and OSATT teams. After the hiring freeze that began in early 2021, we resumed recruitment and filled several key positions. Notably, we are pleased to announce that RAS has a new director, Vivian Holmes, who joined MIT in February and brings years of research administration experience at peer institutions. We continue to actively recruit and hire experienced professionals for the OSATT team, with a strong focus on services that help PIs convert ideas to agreements that enable impactful new MIT research programs.

An initiative for which planning is underway is the development of a new one-stop research dashboard. It will create a single access point to all information about research and sponsored activity for researchers and research administration teams, consolidating information that is stored in various existing systems at MIT.

Ad Hoc Faculty Committee

We are standing up a new committee to inform future progress and further execution. The Ad Hoc Research Administration Faculty Advisory Committee is charged with providing advice and feedback on administrative aspects of the MIT research enterprise, including the learnings from Task Force 2021 and Beyond. Chaired by Professor Rob Simcoe of Physics, with members from all five Schools and the College, it will report to the Provost, Vice President for Research, and Faculty Chair. It will operate initially for one year, at which time the leadership will assess the benefit of its continuation.

Conclusion

This will be the first of a few updates on the transformation of our research and sponsored activity administration enterprise. We appreciate the interest expressed by PIs regarding what they can expect from RAS and OSATT. We'll provide additional details and status about the research dashboard under development. And we'll discuss our work to support researchers with compliance requirements, particularly those related to disclosure requirements to federal agencies, and data security and privacy enhancements. In the meantime, as always, we invite your feedback.

Maria T. Zuber is Vice President for Research *(mtz@mit.edu);*
Krystyn J. Van Vliet is Associate Provost and Associate Vice President for Research *(krystyn@mit.edu).*

Editor's Note: See "M.I.T. Numbers" (back page) for a chart of campus research revenues as percentages by sponsor type, averaged over five fiscal years, 2017-2021.

New Commencement Format for 2022

James Poterba

MIT'S STUDENT POPULATION HAS grown in recent decades, and with it, the number of graduates participating in Commencement has increased. In 2019, 3,556 students received degrees. That represented a 26 percent increase in 20 years; there were 2,828 graduates in 1999. Forty years earlier, in 1979, 2,605 degrees were awarded.

For Commencement ceremonies, bigger is not necessarily better. For students who participated in MIT's 2019 commencement, the elapsed time from assembly until closing was 5½ hours. For faculty, the time commitment was 4½ hours. Although Killian Court was packed with more than 13,000 graduates and guests at the start of the ceremonies, most seats were empty by the three-hour mark. Participants voted with their feet and sent a clear message: graduates and guests thought that the ceremony was too long. Most of those who were fortunate enough to cross the stage early left well before dismissal. In addition to the Commencement marathon, the Investiture of Doctoral Hoods and Degree Conferral Ceremony on the previous day, for 536 graduates, was a 4½-hour commitment. Plans for increasing the number of graduates in future years portend even longer ceremonies ahead.

Motivated by concerns about length as well as the difficulties of adapting the single degree-granting ceremony model in the event of rain, in 2017 and 2018 the Commencement Committee, then chaired by Eric Grimson, began exploring alternatives. Most of our peer institutions combine a shorter all-inclusive gathering that includes a charge to the graduates and address by a Commencement speaker with a collection of smaller events at which graduates individually receive their degrees. The Committee consulted with undergraduates and graduate students, faculty, alumni, and parents of recent graduates as it considered possible ways to adapt this framework to the MIT setting.

The Committee learned that several strong preferences needed to be incorporated in any reform: (i) all students place high value on a Commencement experience in Killian Court; (ii) there is strong support for including at least the current number of guests in the Commencement celebration; (iii) members of the undergraduate class prefer to graduate together, rather than in groups divided by School or department or residence; and (iv) advanced degree candidates appreciate the opportunity to participate in a smaller event, such as the doctoral ceremony in 2019. A new format was developed with those priorities in mind and was approved by Academic Council in 2019, although implementation was delayed by the onset of the pandemic. I am very grateful to the outstanding Institute Events team, including Ted Johnson, Rebecca Tyler, and the recently-retired Gayle Gallagher, who have played a central role in the last three years in developing the details of the new plan. We owe them a great collective thank-you!

Effective with the 2022 Commencement, MIT will shift from a single degree-granting ceremony to a more disaggregate structure that closely aligns with the practices of most other universities with similar numbers of graduates. The new Commencement format has three central elements. First, there will be a OneMIT ceremony on Friday morning (May 27, 2022) in Killian Court for all graduates. The Commencement speaker will address this gathering, the president will deliver a charge to the graduates, and there will be the traditional turning of the class ring. Second, on Friday afternoon, all bachelor's degree recipients will receive their degrees in a ceremony on the athletic fields. A large tent, capable of accommodating a crowd of close to 6,000 graduates and guests, will provide protection against inclement weather. Students who are receiving simultaneous bachelor's and M.Eng. degrees will receive their degrees at this ceremony. Third, there will be School-hosted ceremonies on Thursday afternoon (May 26), or in some cases earlier in the week, for advanced degree recipients. This structure will provide flexibility to adapt programs from year to year. In 2022, for example, the College of Computing and the School of Engineering plan to hold a joint advanced-degree ceremony. MIT Sloan plans to host a number of ceremonies, so that graduates of specialized programs can participate in events tailored to their group. The times and locations of the ceremonies for advanced degree recipients will be announced soon. They will take place in a variety of venues, suited to the size of each group of graduates.

Faculty will play important, but different, roles in the OneMIT ceremony, the undergraduate degree-granting, and the School-level advanced degree gatherings. Some faculty may decide to participate in more than one of these ceremonies, and it should be possible for faculty members to play an active part in the Commencement

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New Commencement Format for 2022
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celebrations with a time commitment that is no greater, and probably smaller, than in the past. Details regarding faculty roles in the OneMIT and undergraduate degree-granting ceremonies will be announced in the spring, and faculty will receive the usual email regarding regalia ordering and registration to participate. Schools will have significant discretion in designing their advanced degree ceremonies and the role that faculty will play in them.

The Commencement Committee has several roles in preparing for the 2022 Commencement. It will oversee the design of the OneMIT ceremony, which is likely to be patterned to a significant degree on the virtual ceremonies of 2020 and 2021. It will also work to coordinate the actions of different Schools, to make sure that the OneMIT and the undergraduate degree granting ceremonies link up appropriately, and to develop a schedule that minimizes conflicts to the greatest degree possible. Later this year, it will also collect feedback on the new model from both faculty members and graduates so that we can evaluate the 2022 experience and consider potential refinements in 2023 and beyond.

The Covid-19 pandemic not only delayed the rollout of the new Commencement model, it also necessitated a shift from in-person to online graduation ceremonies in both 2020 and 2021. In both years, President Reif committed to inviting the graduates to return to campus at a later date for an appropriate celebration. Institute Events is leading the planning for the May 28 in-person graduation celebration in partnership with the MIT Alumni Association, which is inviting the 2020 and 2021 alums to participate in various Tech Reunion activities throughout the weekend. Members of the faculty are welcome to join in all of the ceremonies occurring from Thursday, May 26 through Saturday, May 28. Further details will be available in the spring.

It is never easy to change a tradition, especially one that has been part of the Institute's history for more than 150 years. Yet as circumstances change, we must be prepared to adapt. The members of the Commencement Committee are confident that the new format for our ceremony will continue to provide a vibrant opportunity for our faculty, staff, and guests to join with our graduates in celebrating their achievements, while remedying several shortcomings of our legacy approach that have become increasingly salient in recent years.

James Poterba is Mitsui Professor of Economics in the Department of Economics *(poterba@mit.edu).*

letters

Clarification Needed on MIT's Commitment to Freedom of Speech

To The Faculty Newsletter:

THE LONG STATEMENT by Professors Eduardo Kausel and John Williams ("Is MIT Losing Control of its Own Destiny?", *MIT Faculty Newsletter*, Vol. XXXIV, No. 2) is a deep and brilliant exposition on the sources of underlying strengths and global leadership of MIT. Their recommendations provide powerful guidance as to MIT's needs for clarification by our faculty and senior leadership of MIT's commitment to freedom of speech, expression, and tolerance of differences of viewpoints.

The Kausel-Williams referral to the current draft report and recommendations of the so-called "Values Report" is far too gentle in its treatment of just who are the framers of that set of proposals. Not only is the large majority of that group's members staff and administrators, not faculty, but indeed almost all of those administrators are job-holders in the growing army of DEI advocates. No wonder that they are strongly supporting their own growth in numbers and powers of jurisdiction over all faculty teaching, research, and speech, as well as all administrative programs and actions within MIT. That same issue of the *Faculty Newsletter* contains an article about potential Conflicts of Interest among our MIT leadership. The authors of that article should carefully examine the real conflicts of interest among the authors of the "Values Statement" who espouse protection and elaboration of their own jobs and importance within MIT.

We may not need, to quote the MIT song, to go "back to the days of old at the Tech on Boylston Street"! But we do need to go back to the MIT that espoused and practiced its principles of academic excellence as the underlying basis for those whom we accept as students, invite to become faculty, and promote and eventually tenure. We are the superb institution we have become by adherence to those principles of quality and excellence in all we do and in all we accept into our portals.

Warmest wishes for regaining of the MIT I have known and loved since my entry as a Freshman in 1953.

Edward B. Roberts
David Sarnoff Professor of Management of Technology
Founder/Chair and former Faculty Director, Martin Trust Center for MIT Entrepreneurship
Founder and Co-Chair, MIT Entrepreneurship & Innovation MBA Track

A Unifying Online Proposal for MIT's Educational Mission Based on Open edX

David E. Pritchard

Introduction and Vision

MIT WAS BORN AS an undergraduate institution to prepare students for jobs as "industrial scientists." Today its vast impact is mainly due to its graduate students, postdocs, research staff, and research centers and laboratories – largely supported by outside funding. But even as its size grew 100-fold and its research and spinoffs dominated its mission – (*to advance knowledge and educate students in science, technology, and other areas of scholarship . . .*) educating undergraduates remained in MIT's blood, spawning textbooks, education spinoffs, the edX.org alliance with Harvard, the MIT Office of Digital Learning, MITx (for residential education), TEAL (Technology Enabled Active Learning) and OCW (OpenCourseWare), the principal carrier of MIT education to the outside world (excluding our graduates). The fact that MIT takes the education part of its mission so seriously is one of the roots of my deep affection for this place.

This semester, we have a once-in-a-generation opportunity to improve education at MIT and, more importantly, to vastly increase its impact beyond our campus. The immediate catalyst for this is the sale of many assets of MIT-Harvard edX.org to 2U, Inc. (Nasdaq: TWOU). As a result, MIT and Harvard are challenged to set the course for the new *Center for Reimagining Learning* (CRL), a non-profit with a $600M endowment. Currently CRL's principal obligation is to "steward and enhance the *Open edX* platform and tackle challenges in online learning." (Open edX underlies lms.mitx.mit.edu, the familiar MITx that powers many of our large undergraduate courses generally in conjunction with Canvas.) Simultaneously, the faculty chair and the provost have charged a *Nonprofit Entity Working Group* to "update the entity's charter, its goals, mission, research focus and governance . . ." and also created an *Ad hoc committee on MITx and MITx Online* [a new portal to share MIT's courses and knowledge] to "solicit input and advice broadly on how online education should contribute to MIT's mission of education and research . . . ." Finally, a new Dean for Digital Learning took the reins last month. Out of this maelstrom will emerge MIT's educational impact on its students and on the world for the next decades. It behooves us to do some serious thought about how best to do it.

This semester, we have a once-in-a-generation opportunity to improve education at MIT and, more importantly, to vastly increase its impact beyond our campus.

This article is a proposal to synergistically address these combined challenges.

The crown jewels in MIT's undergraduate educational program are *fully blended teacher-guided* courses that integrate online materials and activities smoothly into a lecture + recitation + office hours environment. To spread these courses widely, we propose that CRL's mission be centered on *improving and spreading the best blended teacher-guided courses at well-endowed colleges like MIT to teachers and students at English-speaking colleges world-wide*. This will involve modifying Open edX to help MIT teachers develop and deliver improved blended courses, then distributing them to teachers at other institutions who will deliver these (perhaps slightly modified) courses to their students while simultaneously receiving assistance from the online platform in teaching them better and more easily.

This proposal addresses the justification and implementation of this proposal as follows. We'll first emphasize the proven superiority of blended learning and the obstacles that impede its widespread implementation, then show how CRL can modify Open edX so that teachers can *demonstrably* improve blended residential education at MIT and elsewhere while redirecting their efforts from course composition to interacting with students; then provide a guide for how CRL can enable teachers worldwide to teach their students using these full blended courses administered on the Open edX platform. We'll continue by outlining a research agenda that will help MIT and other institutions improve their blended learning courses, and conclude by arguing that MIT should begin important parts of this proposal immediately and unilaterally.

Blended Interactive Learning

Blended learning is employed in many

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GIRs (General Institute Requirements), most explicitly in those run in the TEAL format, and contributes to making MIT courses as successful as they already are. As used here, "blended learning" involves mixing face-to-face and online instruction, and typically includes pre-class assignments that inculcate sufficient declarative knowledge in students to prepare them for highly interactive lectures and recitations. Thus it's an inversion of the roles of traditional pedagogy in which lectures are primarily for transferring information and homework for applying it that is sometimes called the "flipped classroom." This enables classes to emphasize deeper learning with concept questions, peer instruction, group problem solving, and other interactive activities. These class elements are complemented by homework, projects, tutoring, and assessments.

Despite research [Hake, Freeman, and Chi] showing that interactive classes increase overall learning by about ½ standard deviation, blended learning is used far less frequently in U.S. and foreign colleges than the traditional lecture/recitation format. This is largely because presenting a fully blended course requires the daunting task of assembling and coordinating many moving parts. In a typical blended week, students encounter three prelectures, three interactive large classes, two interactive small classes (recitations), both online and written homework, a short assessment, with possibly a laboratory, project, or paper in the background. Professors at "rich" universities like MIT are required to teach only one course (e.g., 18.01) and can develop fully blended courses with the help of Digital Learning Lab Fellows, Lecturers, and graduate TAs. Unfortunately, making and administrating blended courses is beyond the capabilities of most teachers at four-year and two-year colleges where faculty are generally required to teach two or more courses without significant help (and adjunct professors often further burdened by teaching multiple courses at multiple colleges). This underlies the desirability of spreading easy-to-use quality blended courses to such venues.

Center for Reimagining Learning Will Spread Blended Learning

To help teachers bring the benefits of blended learning to their students, we propose that CRL should help develop and distribute assignable blended courses and course materials to teachers for use by their students in Open edX, thereby reaching the second and third of edX' original goals: (2) *Enhance teaching and learning on campus and online* and (3) *Advance teaching and learning through research* (the first is *Increase access to high-quality education for everyone*). This would enhance on-campus learning and would predominantly involve typical college courses like our GIRs – both areas where MIT and Harvard have highly relevant educational experience. Furthermore, this shift of mission would involve research into blended learning where we could apply our skills at research while at the same time developing educational content and pedagogy to improve our own educational effectiveness. This shift would provide additional resources for MOOCs (Massive Open Online Courses) and other "direct to remote student" modalities aimed at the edX first goal.

We argue that reorienting the mission towards teacher-directed learning is essential if CRL is to have an impact commensurate with its large endowment, simply because that's where the students are: in the U.S. alone there are over 5000 two- and four-year colleges offering perhaps 20,000 degree programs; for MOOCs (Open edX' original design objective) three large providers offer about 1200 degrees, many in specialty areas [MOOCs in 2020]. Worldwide, college enrollment is forecast to more than double over the next 20 years [Calderon 2018]. In view of these numbers, the proposed shift of mission for CRL may be the best route to reaching new learners.

Executing this revised mission first requires CRL to modify Open edX to make it a better platform for teachers to employ for their students. Then they would help MIT and other rich institutions put their fully blended courses (and components thereof) on this platform. Then CRL would make instances of these courses and materials available to teachers worldwide, allowing them to select which elements of a high-quality fully blended course they want to assign to their students. As a further step in making the Open edX platform helpful to teachers, CRL would support analytics and research that improve blended courses and help teachers implement them effectively for their students.

Changing the audience from the independent learners that edX currently targets to college teachers with their students involves exploiting the familiar (to faculty) models for distribution and dissemination of instructional materials in higher education – i.e., convincing individual teachers (or adoption committees) to require that their students obtain (and pay for) the required materials and subscriptions.

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subscriptions. This is the standard market model for post-secondary education ($10B in the U.S. alone) – a market currently dominated by textbook publishers, online startups, and OER (open educational resources). This approach burdens students with renting or buying a textbook, subscribing to a homework system, and obtaining a clicker in different places. In contrast, CRL's "all full blended course materials in one place" model is far more attractive, both to teachers and students. Furthermore, materials created by and branded with names like MIT or Michigan State or Olin College would have more cachet than Prentice Hall or Addison Wesley or Piazza – especially if we add the bullet point "analytics by MIT" (see Research section). This marketing model also recruits the teachers' networks and professional societies (e.g., the American Association of Physics Teachers) to evaluate and recommend such blended learning materials. Finally, CRL could undersell the commercial solution by over 50%, thereby saving students lots of money and raising a substantial revenue stream with which to develop new courses and improve the pedagogy.

Distributing its blended courses and materials to undergraduates at other colleges advances MIT objectives on several fronts. First, it recruits good graduate students to MIT. Our courses will tend to be used for honors courses and at institutions with the highest ability students worldwide – just the students we want to attract to MIT graduate school. (Selective high schools are also likely to use MIT courses.) Not only is this exposure to MIT courses likely to increase their desire to attend MIT, but having applicants with a grade in these MIT courses allows us to better assess how they will do if admitted. Second, our undergraduate teaching will improve because MIT faculty can incorporate resources, modules, and pedagogies that are developed by our peer institutions, many with discipline-based-educational-researchers (see NAS publication on DBER) or in collaboration with faculty from education departments.

Finally, distributing whole courses complements MIT's wildly popular OCW which functions as a "direct to self-learner" source of knowledge for millions of people worldwide. OCW also serves as a source of knowledge and course materials for teachers – indeed the OCW web page has a prominent *For Educators* link to spread MIT pedagogy and course development procedures. Clearly, distributing MIT's blended courses to students via their teachers not only complements the "direct to viewers" model of OCW, but allows students worldwide to experience a more faithful and more complete version of our pedagogy and materials.

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Modifying Open edX to Help Teachers With Blended Learning

To deliver the full blended courses CRL will need an online learning platform that contains all elements of each blended course in one environment. Clearly, modifying the existing Open edX platform and using the resources and courses it already contains is a great starting point.

Since Open edX was designed for "direct to student" MOOCs it lacks a role for a classroom teacher. The most needed modifications must give teachers a key role in the instruction of their class, reporting on current progress, summarizing exactly how last year's course worked, and the ability to rearrange, edit, and add materials. Informing the teacher starts with *reporting* where their class had trouble with last night's assignment and identifying students who need immediate help – thereby improving instruction in tomorrow's class and office hours. Open edX would also help teachers *rerun* last year's course by identifying materials that functioned poorly (e.g., that were too difficult or time-consuming) so they could be improved or replaced.

Perhaps most importantly, the vast amount of teacher time currently consumed by writing and debugging new materials for this year's class can (and should) be reduced by creating a *curated library* that allows *reusing* resources from previous courses in each domain (e.g., Introductory Newtonian Mechanics, Introductory Organic Chemistry, 18th Century English literature, . . .). These resources will reside in a library that contains both descriptive metadata (topic, subtopic, a one-sentence description.) and dynamic metadata (difficulty, time to complete, percentage of text reread, . . .). Together, these enable teachers to quickly find resources for replacing underperforming resources or even for making substantially new courses. Teachers will be able to incorporate these resources at any desired level of granularity – single resources, subchapters, modules, whole course elements (e.g., all recitation materials or homework, etc.).

Making these changes does not require a huge investment. With three months' programming effort, my education group was able to program working interfaces for the report and rerun features, and also made a searchable *curated library* that combined resources from multiple courses while eliminating duplicates. We are in discussions with OpenCraft to incorporate selected library resources into

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a course with one click in *Studio* (the authoring engine for Open edX).

In several of my recent colloquia and education research talks I've polled the audience on what resources they most need to switch to blended learning. The most desired materials are those for interactive lectures and especially recitations. In many MIT courses instructor notes and/or PowerPoints and concept questions are available and could be incorporated easily to help with interactive lectures. However, if recitations are going to go beyond discussing homework problems identified as troublesome by *report*, materials (e.g., notes and activities) from our most successful recitation instructors must be collected and blended in with the course.

Such an enhanced Open edX is highly suited for extending MIT's courses to off-campus students, for example to accommodate students temporarily absent for personal reasons, or taking Junior year abroad or working on a distant research project or internship. It would also permit many high schoolers to take MIT courses, whether from their teacher using Open edX or remotely from MIT, allowing us to recruit those most compatible with our culture. All of these uses would enable us to increase the number of graduates without expanding the physical size of our campus or the load on our faculty, while rewarding MIT with the likely possibility that the additional graduates would return gifts to MIT exceeding their tuition several times over.

Constant Improvement, Research, and the Future

A foundational objective of this proposal is research-driven improvement of education. This will be achieved by using the central design principle of science and engineering (which is infrequently applied to education), *the feedback loop*. Firstly, the *rerun* and *reuse* features described above enable incremental year after year improvement by identifying resources that don't work well and replacing them with those that work better. By incorporating existing and new research-designed assessment instruments that are well-calibrated, each course can select and then measure the specific learning and general skills that it hopes to engender, then redesign the course to better reach these objectives. This is the process suggested by impactful education reformers like Carl Wieman [Wieman 2017] and Grant Wiggins.

Looking ahead, we'll also need to improve the processes by which we make the courses and administer them to students. We can use psychometrics and other analytics to find which types of resources and which individual resources engender the most learning (i.e., improvement on research-based assessments).

A small cadre of CRL education researchers and learning engineers could help teaching staff at MIT and elsewhere implement these procedures. As an example of the payoff, recent research shows that supplementing traditional online homework with many short deliberate practice exercises increases learning by an additional ½ standard deviation (beyond making the class interactive). Since making the classroom interactive dramatically improves learning, it seems likely that replacing the current lecture videos and textbooks by new research-improved software designed to foster a more interactive out-of-class learning experience would lead to significant additional learning gains. The combined effects of the approaches discussed would be fully blended courses of demonstrated educational effectiveness – a product new to the marketplace (and MIT).

Looking ahead, we'll also need to improve the processes by which we make the courses and administer them to students. We can use psychometrics and other analytics to find which types of resources and which individual resources engender the most learning (defined as improvement on research-based assessments). We can use natural language processing to accept verbal responses, to grade and categorize them, and for classifying problems and exercises. And maybe for recasting existing problems so that it is more difficult for online cheating companies like Chegg.com and Course Hero.com to catalog them and give students the correct answers. Finally, as we accumulate more resources in a given domain, we can personalize homework by having the teacher specify the topics and subtopics and letting an AI agent pick the particular problems best suited to each individual learner. Ultimately the pre-class assignments and homework could emulate a personal tutor who prepares each student for each upcoming class or assessment in view of their current state of knowledge.

This proposal will beneficially change the role of teachers. Picture the teacher as conductor of a youth symphony orchestra whose players are his/her students. The conductor's objective is getting the orchestra to play the best musical program. For some insane reason, the world's conductors must only play their own music, hence must dedicate a huge amount of time to composing music that's in fact highly similar to the compositions of the many other conductors. When implemented, this proposal will allow the conductor to mix in the best compositions from other conductor-composers. This will free time for the conductor to help individual players, and will improve the variety of the music that the orchestra learns to play and the quality of the overall program.

MIT Should Start Now

Without waiting for CRL's plans to develop, I strongly recommend that MIT should immediately modify Open edX to

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give our teaching staff real-time feedback, suggested improvements to rerun courses, and reuse of materials from similar courses. Then OCW should make assignable versions of our courses available to teachers at other institutions for use on their students, simultaneously enhancing OCW's reputation and reaching potential future MIT students. These modifications would likely be widely adopted by MIT faculty and staff using MITx for blended learning, and several of them would be welcomed by current users making MOOCs. These modifications are relatively inexpensive to implement, and they would immediately improve teaching at MIT as well as improving each course that is rerun next year. Importantly, these advancements would be achieved while reducing the amount of new content needed for each rerun – likely amortizing their cost over a few years.

Once our improved courses are available on the modified Open edX platform, releasing active versions to teachers wanting to use MIT courses and/or materials would require little additional effort. This would dramatically improve the education of students at other institutions worldwide, and would be a tremendous avenue for recruiting talented students to come to MIT. MIT could make these courses available through OCW, which would supplement OCW's current audience and increase its worldwide impact. Furthermore, OCW has the experience in readying courses for release (intellectual property, visual packaging . . .) as well as the market experience to make this new avenue of distribution another feather in its cap.

In summary, this proposal describes just one alternative for what we and CRL can do together (or we by ourselves). I hope it spawns discussions and better ideas that lead to a more impactful outcome.

. . . MIT should immediately modify Open edX to give our teaching staff real-time feedback, suggested improvements to rerun courses, and reuse of materials from similar courses. Then OCW should make assignable versions of our courses available to teachers at other institutions for use on their students, simultaneously enhancing OCW's reputation and reaching potential future MIT students.

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David E. Pritchard is the Cecil and Ida Green Professor of Physics in the Department of Physics *(dpritch@mit.edu).*

Editor's Note:
Dave Pritchard and his son Alex invented/developed the online Socratic Tutor called MasteringPhysics.com, Mastering Chemistry, Mastering Engineering, . . . etc. – the dominant homework system in science and engineering (2.5M subscribers/year; owned by Pearson since 2006).

Distracted Driving: Finding a Realistic Solution

Nicholas A. Ashford
Charles C. Caldart

INTERNET-BASED COMMUNICATIONS technology has advanced at a remarkable pace in the last two decades and, like other rapidly emerging technologies, has presented new challenges to privacy, health and safety, and individual freedom. The technology is promoted both by device providers and by vehicle manufacturers, and is embodied in a variety of devices used aboard vehicles: cell phones; nomadic GPS (global positioning system) devices; fixed in-vehicle screens allowing communication (including texting, data input and retrieval, and other cognitive tasks) between drivers, vehicle occupants, and those outside the vehicle; and other communication technologies that operate when the vehicle is in motion. U.S. and foreign courts and regulatory bodies have addressed the liability of drivers, device manufacturers, and/or vehicle manufacturers when injuries are caused by drivers who were distracted by the use of communication devices. Still, the adverse effects of mobile communication continue to mount.

This comment explores the contours of the law and public policy in addressing this clear and present danger to drivers, passengers, pedestrians, and the general public, and argues for specific interventions to minimize adverse effects on public safety. We contribute a more comprehensive analysis in a recent article published in the University of Pennsylvania *Journal of Law and Public Affairs* (https://scholarship.law.upenn.edu/jlpa/).

Although fixed vehicle technologies that permit viewing by the driver are undoubtedly distracting, it is nomadic devices such as cell phones and GPS systems that are viewed as posing the largest potential harm, both because they are ubiquitous and because attempts to restrict their use are often perceived as infringements on freedom of choice and often engender driver resistance. The advent of 5G technologies, with their anticipated increased downloading and streaming capacities, is likely to increase the distractive potential of these nomadic devices.

In large part, government attempts to regulate the vehicular use of such devices – whether through the legislative system or through tort law – have focused their attention on the behavior of the driver. And, in large part, these attempts have not been sufficiently successful. Prohibitions against driver use of cell phones and other hand-held devices are notoriously difficult to enforce. Not only is illegal use often difficult to detect, but it is often difficult to prove beyond a reasonable doubt when it is detected. Even when the penalties for noncompliance are viewed as significant, drivers may choose to continue to use their favorite devices, especially if they view the risk of arrest and conviction as being tolerably remote.

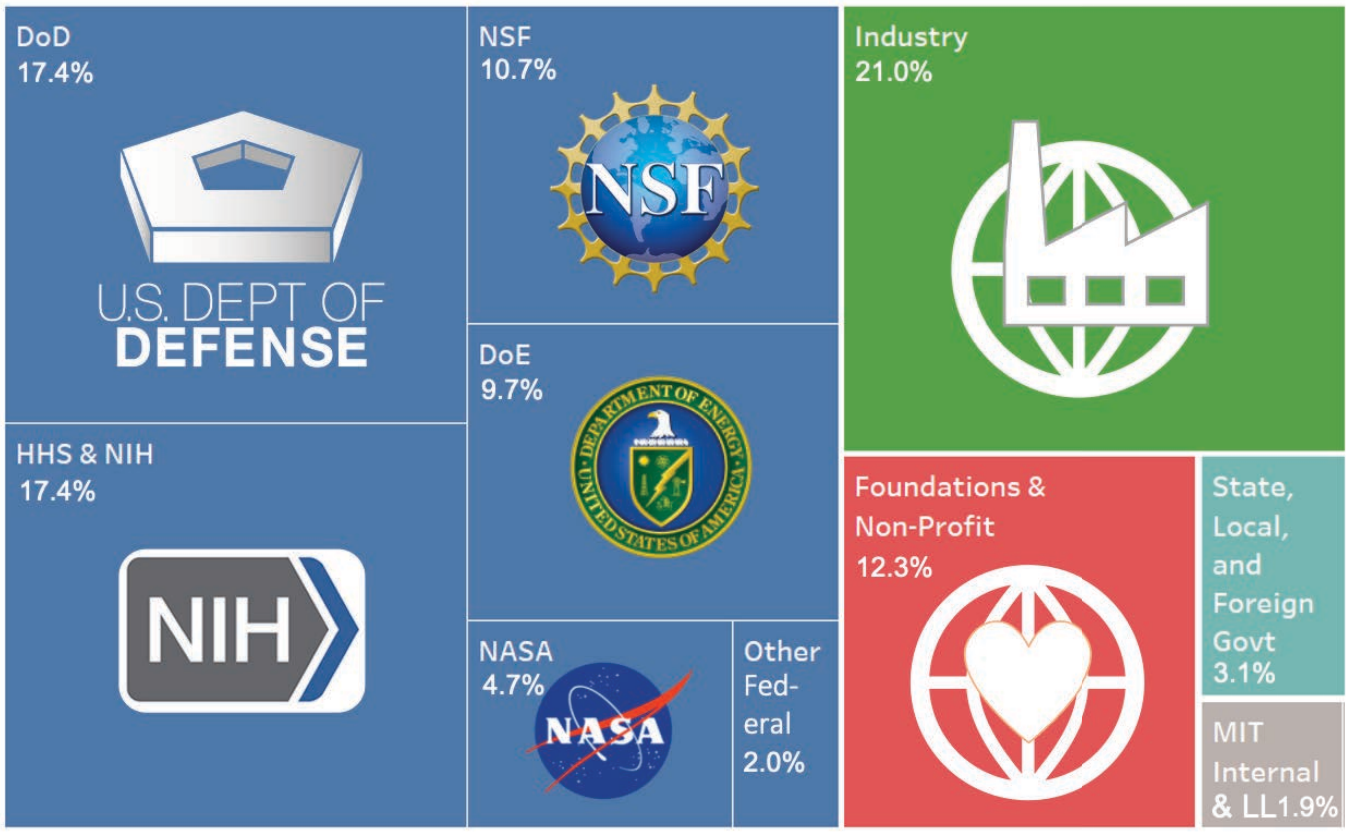
The tort system helps perpetuate this driver-focused approach. It imposes financial responsibility for injury on the driver, the victim, and their respective insurance companies, while confirming for the device manufacturers that they bear no responsibility. And while the imposition of legal liability on the distracted driver likely does have an impact on other drivers, and likely causes some of them to turn off their cell phones when they get in their vehicles, this remains a piecemeal response to an issue that cries out for a more systemic approach.

Fortunately, a common-sense systemic approach is within reach. Apple holds a patent on iPhone technology that prevents drivers from using the phone while driving, and variants on this technology either exist or are in development. A requirement that cell phones and other nomadic devices be equipped with software that prevents the driver from using the device for other than emergency purposes – which device manufacturers have thus far declined to do – would immediately transform roads and highways across the country, and would provide a strong incentive for manufacturers to develop or implement improvements to existing lockout technologies that would allow passengers to use their devices while the car is moving, thus making the lockout more convenient overall. Ideally, this would be done by federal regulation, but it could be accomplished by the state tort system as well. If even one major state, perhaps with encouragement from the state legislature, were to hold a cell phone manufacturer liable for a failure to equip its phone with a mandatory shutoff function, manufacturers would also feel the need to develop and implement suitable technologies.

Either approach, through legislation or litigation, will require political will and strong backing from the public. Proposed legislation regulating cell phone design likely would meet with considerable and well-funded opposition in Congress. And a state court decision imposing manufacturer liability might well face campaigns in Congress and state legislatures for laws insulating the industry from liability. Nonetheless, we believe that the public safety interests at stake are well worth the effort.

Nicholas A. Ashford is Professor of Technology and Policy and Director of the MIT Technology and Law Program *(nashford@mit.edu);*
Charles C. Caldart is Lecturer at the MIT Institute for Data, Statistics, and Society and Department of Civil and Environmental Engineering and a member of the MIT Technology and Law Program *(caldart@mit.edu).*

M.I.T. Numbers
Campus Research Revenues



This graphic shows campus research revenues as percentages by sponsor type, averaged over five fiscal years, 2017-2021.

Source: Office of the Vice President for Research