Report of the President

The Enduring Legacy of Charles M. Vest

Before reviewing our progress over the past year, I would like to reflect on the enduring impact of Charles M. Vest, MIT's 15th president, who served from 1990 to 2004, and who passed away in December 2013. Kind, approachable, and down-to-earth, Chuck led with boldness and integrity, always. Particularly important were his decisions that brought MIT closer to its own ideal as a place where advancement is based on merit and where we welcome brilliant and inventive people of every background.

Memorably, Chuck acknowledged and vigorously addressed discrimination against women faculty at MIT. In the 1990s, women professors in the School of Science began considering, together, how they had been treated in terms of salary, space, and support in relation to their male colleagues. They believed their treatment was unfair, asserting that as they progressed in their careers, they found themselves increasingly marginalized.

Over the next few years, two committees on women faculty in the School of Science investigated the issue and established that the facts supported the assertion of unfair treatment. The committees presented their findings in a report published in the *MIT Faculty Newsletter* in 1999. Chuck wrote a letter endorsing the report and immediately took steps to address the issues its authors surfaced. His actions marked a turning point at MIT and spurred other colleges and universities to address their own institutional biases.

He again demonstrated his commitment to openness and fairness in launching MIT OpenCourseWare (OCW) in 2002. An effort without precedent, OCW published virtually all of MIT's course materials online, making them available to anyone, anywhere in the world, at no cost. Explaining the decision in his *Report of the President for the Academic Year 2000–2001*, Chuck wrote, "The glory of American higher education is its democratizing reach." He aimed to leverage the internet's promise and power to extend that glory to the entire world, and he succeeded.

One among millions of beneficiaries of Chuck's vision is Amol Bhave. As a high school student in Jabalpur in central India, Amol never dreamed of attending MIT. But when cable internet arrived at his home, he began viewing OCW lectures. In 2012, when our new interactive platform MITx launched its first prototype course, 6.002x Circuits and Electronics, Amol signed up for the course and graduated near the top of his virtual class. After learning that we were not yet offering the follow-up class, Systems and Signals, Amol created a website, recruited two other MITx students to help him, and used OCW video lectures and supplementary materials to design his *own* online Systems and Signals course.

How did MIT respond to such audacity? We did the only sensible thing. We recruited Amol for the Class of 2017. He reinforced for us the power of open learning online: its glorious democratizing reach, which expands access to MIT teaching around the world and helps us find people in remote and distant places who truly belong at MIT.

One can draw a straight line from Chuck and OCW to Amol and MITx. Our community, and learners everywhere, will forever owe a debt of gratitude to MIT's visionary 15th president.

Pioneering Online Learning

This year, edX reached 1.7 million learners worldwide—a number 13 times greater than the number of MIT's living alumni. This remarkable growth confirms the great global demand for online learning.

To explore how we can transform the education we offer on and off campus, last year we established the Task Force on the Future of MIT Education. This fall, the Task Force released its preliminary report, which identified a broad range of possibilities, exploring ways to combine digital learning technologies with traditional in-person learning. Since then, the three Task Force working groups—on MIT education and facilities, the global opportunities unleashed by edX, and new financial models for higher education—have investigated the feasibility of those ideas and articulated practical options for making them a reality. We will use the final report of the Task Force as a blueprint for reimagining an MIT education in the 21st century.

We also examined a broader issue of the digital age—how to make sure the explosion of data generated worldwide is used for the greater good while protecting privacy. In March, we hosted the MIT-White House Big Data Privacy Workshop, which brought together leaders in academia, government, industry, and civil society to consider how to design technologies, policies, and practices that balance the risks and opportunities inherent in big data.

Championing Reseach, Both Basic and Mission-Driven

In March 2013, federal sequestration imposed harsh and indiscriminate funding cuts on all of the federal agencies that fund scientific research. In December, Congress passed a budget deal that eased some of the automatic spending cuts, but the measure occurred within the context of a troubling long-term trend: years of declining federal investment in research, as a percentage of gross domestic product.

As a result, important research efforts that could advance fundamental knowledge and improve lives on a large scale have been curtailed. Sequestration hit Boston-area universities and hospitals particularly hard: Massachusetts received $125 million less in federal funding for medical research in 2013 than it otherwise would have.

At MIT, we have worked to protect and sustain our research investments even in this difficult climate. Our Alcator C-Mod tokamak,where researchers conduct important experiments in fusion that may lay the foundation for a new source of sustainable energy, began shutting down in 2012 and ceased accepting graduate students after losing federal funding. As a result of our advocacy, and with support from state and federal leaders, federal funding resumed and the facility reopened in February 2014, bringing nearly 100 staff, faculty, and graduate students back to work. US Senator Elizabeth Warren joined us to mark the occasion.

In this era of diminished research funding, we used MIT's influential public voice to emphasize the value of basic research, highlighting its vital role in seeding the innovation-based economy of the United States. We demonstrated how discoveries arising from basic research find applications in the marketplace, yielding new jobs, companies, and industries. And we underscored the importance of basic research for educating young talent in science and engineering at the very frontiers of human understanding.

Over this past year, I have worked with our faculty to identify the global challenges most in need of MIT's attention, with the goal of coordinating the resources of our five schools to advance mission-driven research. Chief among these challenges is sustainability. To advance this priority, we launched a new Environmental Solutions Initiative (ESI), a campus-wide effort to bring together the physical and social sciences, engineering, and urban planning and policy to promote transformative research relating to the environment. Like the MIT Energy Initiative and other key interdisciplinary efforts, ESI will convene faculty from across MIT to advance research and innovation, leveraging the Institute's strengths to drive meaningful and lasting progress. Professor Susan Solomon, the Ellen Swallow Richards Professor of Atmospheric Chemistry and Climate Science—one of the world's leading climate scientists—will serve as the initiative's founding director.

Another Institute-wide effort, the Abdul Latif Jameel World Water and Food Security Lab (J-WAFS), is primed to lead in finding solutions to two critical sustainability challenges: securing adequate food and fresh water in a world in which two billion people experience chronic hunger or malnutrition and one billion lack reliable access to clean water, and where the population is projected to grow from seven billion to nine billion by 2050. Under the direction of Professor John Lienhard, the Jameel Professor of Water and Food, J-WAFS will focus on helping humanity adapt to population growth, climate change, and an increase in urbanization and development, with solutions to food and water scarcity that draw on expertise across all five MIT schools.

Of course, we cannot address complex challenges without the physical infrastructure to support our research. This year, MIT announced plans to create MIT.nano, a new 200,000-square-foot building that will house a state-of-the-art cleanroom, along with imaging and prototyping facilities for nanotechnology development. The need for such a facility came to light through our MIT 2030 process, which highlighted the increasing range of fields where progress requires the ultraprecise synthesis and manipulation of molecules—including computing, communications, energy, health care, sustainability, materials development, manufacturing, and toolmaking. By providing nanotechnology facilities in a single location, MIT.nano will draw users from more than 150 research groups at MIT, which in turn will build community, inspire new collaborations, and spark novel research.

Accelerating Innovation and Entrepreneurship

In October, I created a faculty advisory committee on the formation of an Innovation Initiative at MIT, with Fiona Murray, the Alvin J. Siteman Professor of Entrepreneurship, and Vladimir Bulović, the Fariborz Maseeh Professor of Emerging Technology, serving as co-chairs. I delivered to the committee the following charge:

> Building on MIT's long tradition of making and doing, the Initiative will give students, faculty, alumni, and others beyond MIT the space, skills, knowledge, tools, and opportunities to design, build, test, prototype, hack, scale up, and accelerate the transformation of academic ideas into practical innovations through ventures, partnerships, and networks.

I look forward to receiving the committee's recommendations for bringing this vision to life through new spaces, research, and education focused on innovation, and through interactions with policymakers, risk capital providers, large corporations, entrepreneurs, and other key players in our innovation economy.

In September, MIT hosted the Production in the Innovation Economy conference. The event marked the release of a three-year study that explored our nation's production potential and the relationship between manufacturing capabilities and innovation. Carried out by teams of MIT faculty and students, the research resulted in two books: *Making in America: From Innovation to Market* and *Production in the Innovation Economy.* The conference sparked important discussions among government, industry, and academic leaders about the future of advanced manufacturing technologies and strategies for growth.

Also in September, President Barack Obama launched the Advanced Manufacturing Partnership 2.0 (AMP 2.0), a continuation of the AMP partnership he created in 2011, to bring industry, academia, and government together to revitalize the manufacturing sector in the United States. MIT President Emerita Susan Hockfield and Andrew Liveris, president, chairman and CEO of Dow Chemical, served as co-chairs of the original partnership. With Mr. Liveris, I will co-chair AMP 2.0. We will provide guidance on the original AMP recommendations, identify strategies for US leadership in manufacturing, and engage the greater manufacturing community in a series of forums. We held the most recent such conference, the MIT-Massachusetts Advanced Manufacturing Innovation Forum, on campus in May.

Heightening Our Global Impact

This year, one of our major international partnerships, the Singapore-MIT Alliance for Research and Technology (SMART), welcomed a delegation of government leaders from Massachusetts, including Governor Deval Patrick. The delegation viewed SMART innovations in vehicle design and traffic analysis, as well as innovations in water distribution, water quality monitoring, and marine robotics. The Singapore University of Technology and Design (SUTD), founded in collaboration with MIT, continued to advance its mission and visibility. SUTD has admitted its first three undergraduate classes and awarded master's degrees to its second graduate class this year.

Representatives from the Masdar Institute of Science and Technology, with which MIT has a multifaceted cooperative program, and members of the government of the United Arab Emirates also welcomed Governor Patrick this year to consider economic partnerships and job creation. I visited the Masdar Institute in April to discuss the important role the research university plays in fostering innovation.

In Russia, the Skolkovo Institute of Science and Technology (Skoltech) welcomed a class of 52 graduate students to campus this fall—the first class to attend lectures on the Skoltech campus. MIT is collaborating with the institute to build its capacity in education, research, and entrepreneurship programs.

Cultivating a Caring Community

While building new connections globally, we were also called upon to support each other here at home. All of us were profoundly saddened in January when we learned that Aaron Swartz, a young internet activist and gifted computer programmer, had taken his own life. Though Aaron had no formal affiliation with MIT, many in the MIT community knew him and admired him. In the days following his death, I charged a panel led by Professor Hal Abelson to conduct a careful, thorough, and independent review of MIT's involvement in the legal struggles that began for Aaron in 2011, resulting from his use of MIT's computer network to download more than four million journal articles. This six-month review resulted in the release of the report "MIT and the Prosecution of Aaron Swartz" in July 2013, which has offered us much to reflect on and learn from.

Also giving us cause for self-examination was a heartrending account published in *The Tech* in January 2014 by a recent MIT graduate. She wrote that she was raped as an undergraduate by an older colleague in her research group, someone she thought she could trust. This brave student's account served as a powerful reminder that sexual assault prevention and response must be a central priority. Sexual assault is a fundamental violation of our values—and a fundamental violation of humanity, period—that will not be tolerated at MIT.

As Cynthia Barnhart assumed the post of chancellor in February 2014, I charged her with assessing the nature and extent of the problem. Chancellor Barnhart spent the spring semester meeting with faculty, staff, and students to learn about the prevalence and effects of sexual assault in our community, the initiatives in place to prevent it, and the measures in place to respond when it happens. I look forward to receiving Chancellor Barnhart's report detailing her findings and recommendations.

An essential strength of MIT is that we welcome, reward, and celebrate talented people regardless of their backgrounds. With the advent of online learning, we are now able to connect with brilliant people from parts of the world that have never before been within our reach. But to live up to our mission, we must make sure that for every member of our community, MIT is a safe and welcoming place, where everyone can develop and apply their talents to the fullest—to invent, create, hack, and discover a better future for all.

L. Rafael Reif
President