THE S UDDENLY R EMOTE S E M ESTER

What MIT did in the face of a global pandemic
MIT’s response to the covid-19 crisis

As the campus mobilized to help undergrads move off campus swiftly in mid-March and faculty shifted to online teaching, members of the MIT community were also diving in to help address the many challenges posed by the pandemic. Researchers applied their expertise (see 77 Mass Ave, page 3). Students built a 1:1 scale replica of the MIT campus in Minecraft as a way to connect online. Full STEAM Ahead began offering online resources and activities for K-12 parents and educators. By mid-May, the MIT Innovation Initiative’s Covid-19 Rapid Innovation Dashboard contained over 200 projects. Here’s a numeric look at MIT’s pandemic response. —Alice Dragoon

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<tr>
<th>IN LESS THAN 5 DAYS IN MARCH,</th>
<th>ABOUT</th>
<th>ROUGHLY</th>
<th>More than</th>
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<tr>
<td>4,000 undergrads departed from MIT</td>
<td>200 undergrads who could not return home remained on campus</td>
<td>1,300 grad students remained in on-campus apartments</td>
<td>500 “success coaches” were recruited in days to check in weekly with undergrads</td>
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| NUMBER OF PPE SUPPLIES donated to local hospitals and first responders FROM MIT LABS AS OF MAY 1: | 543,763 |

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<tr>
<th>BETWEEN MID-MARCH AND MID-APRIL,</th>
<th>ON APRIL 7</th>
<th>BETWEEN April 1 and April 15</th>
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<tr>
<td>Visits to MIT’s OpenCourseWare increased more than 75 percent</td>
<td>Learners and educators accessed materials from nearly 2,500 MIT courses</td>
<td>NEARLY 100,000 people enrolled in MITx online courses</td>
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| 8,005 people “attended” MIT’s first virtual Town Hall hosted by President Reif, over 10,000 tuned in for another on May 5. |

| 300 Number of students who signed up to take a computational thinking class focused on COVID-19 response |
| 75 Number of beds in the Sean Collier Care Center, a pop-up hospital set up in Johnson Arena if needed to care for COVID-19 patients who require monitoring but not ICU |

| 75 |

| 1,215 Number of students who logged in for virtual Campus Preview Weekend events during April: |
| 1,113 Number of students who attended Campus Preview Weekend in person in 2019: |

<table>
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<th>More than $2.4 million</th>
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| Amount of money raised from 2,286 donors for MIT covid-19 work as of May 15 |

It was hard. All of it. But when it was time to leave campus there was this surreal sense of joy in the air. The MIT community had really come together in an unprecedented way to be there for one another, to take care of one another.” —Afeefah Khazi-yed ’21
Planning for the unknowable future
From the president | MIT weighs the options for fall.

77 Mass Ave
An MIT team designed disposable face shields to protect medical workers; fluid dynamics show that coughs and sneezes can send droplets flying far more than six feet; experimental molecules could fight covid; cities that imposed the most aggressive social distancing to combat the 1918 flu had the strongest economic recoveries; three MIT astronauts share advice for social isolation; researchers have identified cell types most vulnerable to covid-19 invasion; an MIT team turned a decade-old student design for a low-cost ventilator into a production prototype in weeks; smartphone-based contact tracing can protect privacy; and more

The 1918 flu at MIT
1865 | In the shadow of the Great War, the pandemic that hit campus in the fall was not well documented.
By Nora Murphy

Alumni connection
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Puzzle corner

MIT News
Senior editor
Alice Dragoon
Chief creative officer
Eric Mongeon
Art director
Emily Luong
Photo editor
Stephanie Arnett
Copy chief
Linda Lowenthal
Alumni connection editor
Nicole Estvanik Taylor
Puzzle corner editor
Allan Gottlieb ’67
Contributors
Karen Arenson ’70; Mindy Blodgett; David L. Chandler; Jennifer Chu; Peter Dziuk; Kyle Foy; Mary Beth Gallagher; Abby Harris ’26; Alexandra Kahn; Nora Murphy; Caroline Powers ’23; Anne Trafton; the MIT News Office
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Contact MIT News:
mitnews@technologyreview.com
One Main Street, 15th Floor
Cambridge, MA 02142

At left: Storage trucks stood ready for students boxes as undergraduates packed up to leave campus in mid-March. After spring break, all classes were conducted remotely.
Planning for the unknowable future

As I write, we are piloting the protocols required to begin bringing on-campus research safely up to speed again. And we are engaged in a new effort to make key decisions about the next major milestone in the academic calendar: the start of the fall semester, which will be gearing up another 10 unknowable weeks from now.

The decisions for the fall and beyond involve a large number of interrelated factors and enormous uncertainty—a systems optimization problem that is both MIT-hard and deeply human. Our first priority must be protecting the health and well-being of our community and the many communities we touch.

After modeling a wide range of scenarios and taking the current public health advice into account, we do not think it very likely that we can all be on campus together this fall. Since every available path involves complex trade-offs, each in some way painful or unattractive, we are reaching out in many different ways to share with the community what we have learned so far, and to gather insights and ideas. We believe we must reach a decision by early July; I am confident that by working through these choices together, we will arrive at a solution that is truly worthy of MIT.

L. RAFAEL REIF
June 1, 2020
In March, the shortage of face masks and other personal protective equipment (PPE) that health care professionals need to stay safe in the face of the pandemic reached the point where some resorted to cloak-and-dagger machinations to secure shipments from overseas. But a team from MIT came up with another solution: a quick, inexpensive technique for mass-producing disposable face shields, which medical staff can wear over their masked faces to extend the useful life of available PPE.

Martin Culpepper, SM ’97, PhD ’00, a professor of mechanical engineering and director of Project Manus, MIT’s effort to support maker activities, got the project under way in March. He and his team sought a shield that would be fast to produce, landing on a flat design that could be folded into a 3D structure as needed. As much of MIT’s campus life came to a halt, Culpepper started prototyping, using a laser cutter he had in his house. Aided by his children, he tested different low-cost materials and made the first 10 prototypes at home.

Next Elazer Edelman ’78, SM ’79, PhD ’84, director of MIT’s Institute for Medical Engineering and Science (IMES) and leader of the Institute’s PPE task force (see “A professor’s ‘new normal’ is anything but,” page 26), showed doctors and nurses at area hospitals how to store, assemble, and use the shields. Participants found that the shields were easy to put together and protected them well against splashes or aerosolized particles that might expose them to the virus. “The single greatest insecurity of a health-care provider is the thought that we will become infected and in doing so be unable to perform our duties or infect others,” Edelman says.

By late March, the team had shifted to mass manufacturing through a process known as die cutting. By mid-May, nearly 500,000 shields had been produced. “This process has been designed in such a way that there is the potential to ramp up to millions of face shields produced per day,” says Culpepper. “This could very quickly become a nationwide solution if traditional supply chains can’t keep up.”

MIT purchased the first 45,000 face shields to donate to hospitals in Boston and beyond; manufacturer Polymershapes also donated 60,000.

“This project was a great example of collaboration across MIT and the employment of mind-heart-hand,” Culpepper says. “When we reached out to others, they dropped everything to put their minds and hands to work helping us make this happen quickly.”

—Mary Beth Gallagher
Don’t sneeze so close to me

Fluid dynamics show that coughs and sneezes can send droplets flying far more than six feet.

When someone coughs or sneezes, just how far do bystanders have to be to avoid the germy spray? Lydia Bourouiba, an associate professor directing the Fluid Dynamics of Disease Transmission Laboratory at MIT, says it’s farther than once thought.

Through experiments in the lab and clinical environment, she and her team found that what we’re dealing with isn’t a spray of individual droplets that quickly fall to the ground and evaporate; instead, it’s a cloud of hot, moist air that traps droplets of different sizes together, propelling them much farther than any one would be able to travel on its own. A cough can transmit droplets up to 13 to 16 feet, while a sneeze can eject them up to 26 feet. Surrounding air conditions can further disperse the residual droplets in upper levels of rooms.

“A surgical mask is not protective against inhalation of a pathogen from the cloud,” says Bourouiba, who has published a paper on the implications of her work in the Journal of the American Medical Association. “For an infected patient wearing it, it can contain some of the forward ejecta from coughs or sneezes, but these are very violent ejections and masks are completely open on all sides.” She recommends that health-care workers wear a respirator whenever possible.

—Jennifer Chu

Experimental molecules fight covid

Researchers are testing lab-designed peptides and cytokine receptors.

Two MIT research groups have designed biological molecules that could help combat the effects of covid-19. One team, led by principal research scientist Shuguang Zhang and research scientist Rui Qing, developed proteins that could be injected into the body to block “cytokine storms,” immune-system overreactions that damage the lungs and can be fatal. The proteins, lab-modified versions of naturally occurring cytokine receptors, could bind to excess cytokines and remove them from the system, says Qing. Tests in human cells and animal models are planned.

The other team, led by associate professor of chemistry Brad Pentelute, designed a short protein fragment, or peptide, that can bind to the viral protein used to enter human lung cells, potentially disarming it. The peptide mimics a cell surface protein that attaches to one of the protein spikes protruding from the coronavirus. The researchers have sent samples to collaborators who plan to carry out tests in human cells.

—Anne Trafton

What 1918 can teach us

After the flu pandemic, cities that had imposed the most aggressive social distancing achieved the strongest economic recoveries.

In the face of a debate about when the US might “reopen” commerce to limit economic fallout from the covid-19 pandemic, a study coauthored by MIT Sloan economist Emil Verner shows that restricting economic activity to protect public health actually generates a stronger economic rebound. Using data from the flu pandemic that swept the US in 1918–19, the working paper finds cities that did more to limit social and civic interactions had more economic growth later. Indeed, cities that implemented social distancing and other interventions just 10 days earlier than their counterparts saw a 5% relative increase in manufacturing employment after the pandemic ended, through 1923. Similarly, an extra 50 days of social distancing was worth a 6.5% increase in manufacturing employment.

Verner says the implications are clear: “It casts doubt on the idea there is a trade-off between addressing the impact of the virus, on the one hand, and economic activity, on the other hand, because the pandemic itself is so destructive for the economy.”

—Peter Dizikes
Lessons from space

Three MIT grads who spent months on the International Space Station share advice for social isolation.

As much of the world struggles to adjust to enforced social distancing, NASA astronauts Cady Coleman '83, Mike Fincke '89, and Greg Chamitoff '92 find the situation somewhat familiar—all served long missions aboard the International Space Station, not even on the planet with their families and friends. Among their tips for the rest of us:

- Maintain a schedule of necessary tasks as well as activities to look forward to. “Just because I don’t have to go into work doesn’t mean I shouldn’t get up and be showered and dressed,” Fincke says.
- Concentrate on the things you can control, such as learning new skills, and avoid dwelling on the things you can’t.
- Take care of yourself.
- Remember that we are doing this for a reason. As Coleman says, “Right now our mission is to keep each other safe here on Earth.”
- Above all, realize that even if we are isolated, we are not alone. “We are an incredibly adaptable species,” Chamitoff says. “We live in all sorts of extreme environments, including zero gravity. One thing we do need, however, is each other.”

—Jennifer Chu

Where the coronavirus strikes

Researchers have identified the specific cell types most vulnerable to viral invasion.

The symptoms of covid-19 often affect the respiratory and digestive systems, so it makes sense to suppose that the virus may target cells in those parts of the body. Now researchers at MIT, Harvard, and elsewhere have identified specific types of cells in the lungs, nasal passages, and intestines that are particularly susceptible.

The research, led by chemistry professor and IMES researcher Alex K. Shalek and former postdoc Jose Ordovas-Montanes (now at Boston Children’s Hospital), grew out of other scientists’ work showing that the virus takes advantage of two human receptor proteins, angiotensin-converting enzyme 2 (ACE2) and TMPRSS2, to bind to host cells and get inside them. Using existing data, they were able to search for cells that express RNA for those proteins much more than others do, meaning they are more likely to produce the proteins and thus be more vulnerable to the virus. These include mucus-producing cells in the nasal passages, lung cells responsible for keeping the alveoli (air sacs) open, and intestinal cells responsible for absorbing certain nutrients.

Much of the data came from labs participating in the Human Cell Atlas, a project to catalogue patterns of gene activity for every cell type in the body. “Because we have this incredible repository of information, we were able to begin to look at what would be likely target cells,” Shalek says. “Even though these data sets weren’t designed specifically to study covid, it’s hopefully given us a jump-start.”

The data could help scientists working on new covid-19 treatments or testing drugs that could be repurposed. “Our goal is to get information out to the community and to share data as soon as is humanly possible,” Shalek says. —Anne Trafton
When professor of mechanical engineering Alex Slocum Sr. ’82, SM ’83, PhD ’85, and his son, Alexander Slocum Jr. ’08, SM ’10, PhD ’13, started hearing the reports out of Italy in early March, they knew a crisis was heading our way. So many Italians hospitalized with covid-19 were having trouble breathing on their own that medical staff were forced to ration their ventilators, the potentially life-saving devices that keep air flowing into a patient whose lungs are failing. Slocum Jr., a mechanical engineer who is now a surgical resident at the Medical College of Wisconsin, dug into the data to predict the potential ventilator shortage in this country. “The numbers are frightening, to put it bluntly,” he says. “We estimated a shortage of around 100,000 to 200,000 ventilators was possible by April or May.”

Slocum Sr. pulled out a design developed a decade ago as a student team project in the 2.75 (Medical Device Design) class he’d taught with research scientist Nevan Hanumara, SM ’06, PhD ’12. He and his other son, Jonathan Slocum ’14, SM ’15, ScD ’18, began sketching ideas and quickly sent a rough CAD model to the Hobby Shop, where Coby Unger printed the parts. Hanumara and the Slocums rapidly pulled together volunteers with expertise in mechanical design, electronics, and controls, plus doctors with experience in treating respiratory conditions. The team, called E-Vent, started working nonstop to refine the design, which had originally cost about $500 to build (a conventional ventilator can cost $30,000), and began posting their research online. Within four weeks, production of the first devices based directly on their work had begun in New York City.

That machine, called the Spiro Wave, was given preliminary FDA approval in April; the consortium of companies producing it—which includes 10XBeta, founded by Marcel Botha, SM ’06—expected to quickly deliver hundreds of units to hospitals in New York and, eventually, around the country. As of mid-May, E-Vent was continuing to develop the design further and sharing what they learned in the form of open-source guidelines that local teams can adapt to their materials and needs.

The principle behind the original design is simple: take an emergency resuscitator bag (Ambu is a common brand), which is designed to be squeezed by hand, and automate the squeezing action using a pair of curved paddles driven by a motor. But there’s a lot more to it, Hanumara says: “The controls are really tricky, and they have required many iterations as our understanding of the clinical and safety challenge grew.”

“Covid patients often require ventilation for a week or more, and in longer cases that would mean about a million breaths,” adds Slocum Jr., who helped lead the initial ramp-up of E-Vent. So the paddles are designed to minimize wear on the bag. The team also includes Daniela Rus, head of CSAIL; Albert Kwon ’08, HST ’13, an anesthesiologist at Westchester Medical Center in New York; and many others.

“While our design cannot replace a full-featured ventilator,” Hanumara stresses, “it does provide key ventilation functions that will allow health-care facilities under pressure to better ration their ICU ventilators and human resources.”

—David L. Chandler
Contact tracing without Big Brother

Contact tracing—notifying people who might have been exposed to disease—will be key to controlling the covid-19 pandemic until a vaccine is available, but the tactic raises obvious privacy concerns. Now a team led by MIT researchers and including experts from many institutions is developing a system called Private Automatic Contact Tracing (PACT) that augments the efforts of public health officials without compromising privacy.

The system relies on short-range Bluetooth signals emitted by people’s smartphones. These signals represent random strings of numbers, likened to “chirps” that other nearby phones can remember hearing. Institute Professor Ron Rivest and Daniel Weitzner, a principal research scientist in the Computer Science and Artificial Intelligence Laboratory (CSAIL), are principal investigators on the project.

People who test positive for covid-19 can upload the list of chirps their phone has put out in the past 14 days to a database. Other people can then scan the database to see if any of those chirps match the ones picked up by their phones. If there’s a match, a notification will inform those who may have been exposed to the virus, giving them advice from public health authorities on next steps to take. But none of the chirps will be traceable to a specific person. “We’re not tracking location, not using GPS, not attaching your personal ID or phone number to any of these random numbers your phone is emitting,” Weitzner says.

This approach to contact tracing benefited from the early work of Safe Paths, a citizen-centric, open-source set of digital tools and platforms being developed in a cross-MIT effort led by Media Lab associate professor Ramesh Raskar with input from many other organizations and companies.

The Safe Paths platform, currently in beta, comprises both a smartphone application, PrivateKit, and a web application, Safe Places. The PrivateKit app will enable users to match the personal diary of location data on their smartphone with the anonymized, redacted, and blurred location history of infected patients. The PACT Bluetooth protocol will also be available through Safe Paths.

Maintaining privacy has been a guiding principle for the project. “User location and contact history should never leave a user’s phone without direct consent,” Raskar says. “We strongly believe that all users should be in control of their own data, and that we should never need to sacrifice consent for covid-19 safety.”

—Kylie Foy and Alexandra Kahn

MIT and covid-19

In virtual town hall, MIT leadership updates community on covid-19 responses

Critical research continues, students and staff are receiving support, and contingency planning proceeds for eventual phased reopening.

Virtual hackathon unites international community to tackle covid-19

University students and professionals connect online to find practical solutions to problems linked with the current pandemic.

The changing world of work

MIT Task Force on the Work of the Future responds to rapid changes brought by the pandemic.

Testing whether uncertified N95 masks are effective

Lincoln Laboratory joins MIT and others in testing N95 and similar, imported respirator masks to check how well they keep out particles and blood.

SHERLOCK-based one-step test provides rapid and sensitive covid-19 detection

New CRISPR-based research tool delivers results in an hour; researchers share protocol and kits to advance research and move toward clinical validation.

Myth-busting on YouTube

Postdoc Izabella Pena uses social media to combat the infodemic about the covid-19 pandemic.

More coverage at news.mit.edu
MIT Technology Review’s annual flagship event on emerging technology and trends goes online.

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The 1918 flu at MIT

The 1918 influenza epidemic, which killed an estimated 50 million people worldwide, hit the US in three devastating waves. But its arrival at MIT ranks as little more than a footnote in the Institute’s archives, overshadowed by the urgency of training soldiers for the Great War.

As the start of the 1918–19 academic year approached, it was anything but business as usual at the Institute. The US had been at war since April 1917, and MIT’s president, Richard Maclaurin, felt strongly that “academic institutions, particularly those with strong science and engineering programs, must play a central role in national defense.” In late 1917, the faculty had decided to support the war effort by running courses almost continuously throughout the year, temporarily omitting those less important for war.

In July 1918, Maclaurin was appointed by the US secretary of war as educational director of the new Student Army Training Corps (SATC). Established by the government in early 1918, the SATC was similar to the ROTC, offering those volunteering for military service an opportunity to get a college education as they trained. Maclaurin’s responsibilities included choosing locations for units, selecting courses, and managing the organization nationwide.

But when the War Department decided in early September that it wanted to have five million troops in Europe by the summer of 1919, Maclaurin had to swiftly reorganize the SATC into what amounted to a series of mobilization camps. A month later, these camps were starting up all over the country. As the program grappled with the influenza epidemic, the difficulties of housing and feeding the men, and the need for entirely new schedules of instruction, all final decisions—which affected 524 institutions and 150,000 men—rested with Maclaurin.

Just as MIT was finalizing the construction of five SATC barracks and a mess hall meant to accommodate “a thousand men at a sitting,” as The Tech reported, the flu hit Boston. At the request of local and federal authorities, MIT postponed the start of the academic year by three weeks. To avoid large gatherings of people, the planned October 1 SATC induction ceremony was pushed to October 11 and the opening of the mess hall was delayed. “It is the wish of the Registrar and his colleagues that all students keep away from the Institute until further notice. Students living east of New York City are requested to leave immediately for their homes,” read an October 2 notice in The Tech. “The offices of all the Faculty are to be closed, and only those who are on absolutely important business will be admitted to the Institute. It is our aim to aid in every possible way the fight against this terrible disease which now seems to have passed its crisis. Institute men, do your part. Make this extra time count. It will be some time before we get another vacation.”

The “terrible disease” would not leave the Institute unscathed. On October 12, The Tech began reporting the deaths from pneumonia or influenza of alumni in the military. November 6 marked the first mention of illness on campus, with a notice of the deaths of two SATC students.

Word of the impending armistice reached MIT a few days later. The November 9 issue of The Tech reporting that news also included a little more detail about the extent of the influenza epidemic on campus. An article about the use of the Phi Beta Epsilon fraternity house as the SATC infirmary said that “at present there are forty-five on the sick list. During the recent epidemic, eighty-three patients were taken care of.” Only two had died.

With the war suddenly over, the need for the SATC evaporated, and MIT returned to training scientist and engineers. After a fall in which, as The Tech noted, there was “no college spirit or college life,” social and athletic clubs began starting up in December. By year’s end, the epidemic had claimed the lives of at least three more students and an instructor. But the toll it had taken on the Institute had gone largely unrecorded.

In the shadow of the Great War, the pandemic that hit campus in the fall of 1918 was not well documented.

By Nora Murphy
Dear Class of 2020,

You have graduated—or should I say tumbled—into a world torn apart by a virus. Your final semester evaporated into the internet. In place of hacks and hugs, you had Zoom and Facebook video chats. Instead of face-to-face tutorials, you had Zoom and Google meetups. Rather than hours in the lab with UROP mentors, you had conversations via Slack and email. And instead of triumphantly striding down Killian Court in your caps and gowns to the applause of your families and friends, by the time you read this, you will have seen your names scroll across computer screens in a virtual commencement.

You have the deep sympathies of my class, the Class of 1970. For many of us, much of our time at MIT was disrupted by the tumult in society: Vietnam War protests, civil rights upheavals, the assassinations of both Martin Luther King Jr. and Robert Kennedy. The first semester of our senior year was upended by protests at MIT, following building takeovers and bloody police busts at Columbia University and then Harvard. The first Selective Service draft lottery was introduced in December of our senior year, creating anxieties for the roughly half of our class with low draft numbers, who suddenly found they might not have smooth sailing into jobs after graduation.

Our final semester, too, was thrown off kilter when the National Guard shot and killed student protesters at Kent State University on May 4. Millions of students went on strike, shutting down classes at high schools and colleges across the country. Some universities canceled their graduation ceremonies. MIT made classes optional for the rest of the semester, which became optional Pass/No Record, and many students left campus early.

Although we had commencement, the speech by MIT’s president was replaced by two minutes of silence. Only 60% of our class even came. Many of those who did attend wore armbands with peace symbols. Graduates who had entered MIT to pursue engineering and science careers cast around for alternatives so they wouldn’t have to enter the military-industrial complex supporting the war. And the economy we graduated into was none too healthy: a mild recession, followed by a worse recession and more than a decade of low growth and sharply higher inflation.

My classmates and I find it ironic that our 50th reunion, when we would have donned cardinal-red jackets and led the commencement procession into Killian Court, was also doomed. We tried to be creative in staging virtual commencement activities. We set up a Flickr gallery of classmates in their jackets and other red regalia. (I feel happy every time I look at it.) We created a coronavirus survey that more than 235 classmates took, and as I write this, we’re making plans to present the results at our virtual reunion at the end of May.

Alan Chapman, one of our class musicians, is slated to perform. I feel happy every time I look at it.

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Karen Arenson, the Class of 1970 president and the 50th-reunion planning chair, was a New York Times reporter and editor for 30 years. She’s a former president of the MIT Alumni Association and has served on the MIT Corporation and its Executive Committee.

Karen Arenson today and at her commencement in 1970 after a fall anti-war protest (left) and an impromptu Grateful Dead set outside W20 on May 6, 1970.

Paging through our 50th-reunion book—the digital version, since our printer was deemed a nonessential business—makes it clear that most of my classmates eventually found their way. Some started in one field and moved to another: from software to the ministry, from tech to outdoor landscaping. Some traveled the world for a year or two, signing up for the Peace Corps or other service organizations. I recall feeling the need in my early 20s to move quickly, not to waste a moment. Looking back, I know there was more time than I thought.

Now, you and we are joined together in a very different historic moment. Observe it. Learn from it. Try to help the world. Being useful feels good. When we recover, appreciate the pleasures in life that we used to take for granted: friends, families, work, and celebrations like graduation ceremonies and reunions. And move ahead with your lives. You have lost something, but you are MIT graduates, and you will be fine.

Stay safe. And stay in touch with each other and the MIT community. Good luck!

Karen Arenson ’70

“"We learned to be flexible, to go with the flow. Certainly, mourn what you have lost, but then figure out what you can do to make the world a better place.”"
The remote
As COVID-19 spread into the US, MIT made the seemingly unthinkable call to send students, faculty, and staff home. Here's how that decision went down—and how the Institute retooled on the fly. By Alice Dragoon
New covid-19 hot spots began emerging. Having closely monitored the epidemic’s spread since early January, a team led by MIT Medical director Cecilia Stuopis and director of emergency management Suzanne Blake realized that even more people who’d been abroad would need to self-quarantine. And it soon became clear that MIT had to prepare for the real possibility that the coronavirus would indeed spread onto campus.

On the evening of Monday, March 2, Blake asked six MIT administrators to pull together working groups to figure out how to respond if that happened. They charged three groups with making a plan to keep things running in academics, research, and business should covid-19 disrupt MIT operations. Three more would coordinate MIT’s medical response, think through the implications for students and their living situations, and handle communications.

As chair of the newly formed Academic Continuity Working Group (ACWG), Waitz assembled a team of 25 and convened its first meeting that Wednesday. MIT’s dean of digital learning, physics professor Krishna Rajagopal, would play a key role on that team. He recalls thinking that the ACWG would spend weeks figuring out what scenarios to plan for and then devote a few more weeks to the planning itself.

It turned out the time to make such plans would be measured in days, not weeks. “It wasn’t clear yet what was coming, but it was clear we had to pay attention,” Rajagopal says. “And it got more clear by the day.” On Thursday, March 5, the Institute announced a ban on all MIT-sponsored international travel and canceled all on-campus K-12 programs—including Campus Preview Weekend—and all nonacademic events involving 150 or more people.

As the ACWG began scenario planning, a subgroup dedicated to remote teaching and learning dove into nearly round-the-clock planning to make sure MIT was prepared to offer instruction virtually if needed. Their immediate worry was the 21 classes with 150 or more students. “We thought if we replaced the very largest lectures with something online, we could run until spring break and figure out at spring break what to do next,” Rajagopal says. On Sunday, he and Waitz told the faculty teaching those classes that they’d have until Tuesday, March 10, to switch to an online format. Some pushed back, saying that was too soon.

But that same day, Blake called Waitz to tell him that public health experts were now recommending social distancing. So he shifted the ACWG’s focus. Instead of planning for a range of scenarios, they’d need to prepare to execute the one that was most likely: going remote. “On Monday, it was clear we were only planning for one scenario: we were going to empty out the campus,” he says. “It was just a question of when.” That Monday, March 9, Waitz instituted a daily 8 a.m. Zoom call with the original

“Ian Waitz, vice chancellor for undergraduate and graduate education, leads the Academic Continuity Working Group.
Students who sign up for MIT’s introductory mechanical engineering class 2.00b are in for a semester of incredible rigor but also incredible fun. And not just because they’re designing toys. Like Plato, mechanical engineering professor David Wallace, SM ’91, PhD ’95, also the mastermind behind the epic product design class known as 2.009, believes effective teaching relies on amusing students’ minds. So for Wallace and lecturer Josh Ramos ’11, SM ’13, PhD ’18, it’s a labor of love to give first-year students an engaging way to learn about product design—and get them to push themselves in the lab and enjoy the challenge.

Working in teams of five or six, students go through all the steps a design team would follow to move from concept to usable product as they brainstorm ideas, model them, and build prototypes, incorporating feedback from kid “playtesters” into their designs. Ultimately each team refines one of its prototypes into a nearly final toy.

When students got sent home mid-semester, Wallace and Ramos still wanted them to be able to build their designs. The 2.00b teaching team sent each student two kits—one containing materials such as fabric, foam core, balsa wood, modeling clay, and basic tools, the other filled with electronics components (arduinos, servos, LEDs, and the like). The teams would still meet virtually to bounce ideas off each other and consult with lab instructors. But instead of collaborating on team designs, all the students would design and build a toy for the people on their personal quarantine “island,” using only the items in the kits—a useful lesson in designing with constraints.

Wallace and Ramos also revamped the semester’s milestones, and the teaching team offered round-the-clock feedback within minutes on Slack and gave all 92 students individual written feedback and Zoom consultations after each milestone. Then they developed completely new lectures for the rest of the semester. They added one on HTML coding so students could create websites and upload sketches and CAD designs into their online portfolios ahead of milestone reviews. Others covered things like cloud-based CAD and a crash course in producing and editing videos for students’ final “playsentations,” which premiered at semester’s end in a virtual 2.00b multiplex cinema.

In all, Wallace and Ramos created nine new lectures on the fly, filming and producing each one from their homes in a matter of days and injecting them with the same sense of play and fun that they aim for on campus. The lectures, which incorporate video clips, animations, and thoughtful use of sound, are designed both to guide students through the steps of the design process and to get them excited about doing the work.

“Ultimately, all the learning is when you go off and do it,” Wallace says. “In some sense, we’re trying to set up a playing field that they want to spend time in.”

Despite the intense deadlines, developing new course content and figuring out how to do online lectures was “kind of fun,” Wallace says. “It’s an example of trying to execute under constraints, and using them as an opportunity, which is in some sense what design is about.”
In 8.13 and 8.14, the 18-credit-hour classes known as Physics Junior Lab, students are introduced to experimental physics by replicating classic early-20th-century discoveries in such things as special relativity, quantum mechanics, and nuclear physics. The labs involve a lot of finessing of equipment, connecting of cables, and twiddling of knobs—not the sort of thing you can easily put online.

But Junior Lab professors Gunther Roland and Phil Harris, PhD ’11, both regularly collaborate with researchers around the globe on particle physics experiments requiring the analysis of enormous data sets. These big projects require that all of them be able not just to communicate across time zones but also to access and edit notebooks in the lab, but Roland says having lab partners use a shared online notebook encouraged more collaboration, an essential skill for experimental physicists. Students both edit the same document, and instructors can scroll through their notebooks in Zoom meetings and see their plots and calculations. Roland and Harris plan to keep the online shared notebooks—perhaps add a menu of projects like those using LIGO and LHC data—when everyone’s back on campus.

“I don’t think it should be the only way,” Roland says, since that sort of analysis-based work lacks what he calls the “fiddling-with-the-knobs part” so essential in experimental physics. “The hands-on component is also very important. But it allows the students to do things that are cutting-edge right now instead of cutting-edge in the 1920s.”

For the remainder of the semester, the Institute would convert the financial aid funds that would have covered housing and dining into cash payments that went directly to the students themselves. "It’s my sincere hope we get to spring break, but I don’t know if that will occur."

So when the classes went online, they had students use data from the Large Hadron Collider at CERN to replicate the analysis that confirmed the existence of the Higgs boson. Students also got to work with data from the Laser Interferometer Gravitational-Wave Observatory (LIGO) and repeat the analysis that identified the gravitational waves caused by the collision of two black holes—work published in 2016 that led to a Nobel Prize for MIT professor Rainer Weiss.

Junior Lab students, who work in pairs, can no longer look at each other’s notebooks in the lab, but Roland says having lab partners use a shared online notebook encouraged more collaboration, an essential skill for experimental physicists. Students both edit the same document, and instructors can scroll through their notebooks in Zoom meetings and see their plots and calculations. Roland and Harris plan to keep the online shared notebooks—and may add a menu of projects like those using LIGO and LHC data—when everyone’s back on campus.

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On campus, Junior Lab involves a lot of hands-on work—and troubleshooting when instruments don’t cooperate. ACWG team along with all MIT deans and department heads, many faculty committee chairs and associate department heads, and key staff members—about 130 people in all. “We may be advising students to go home and stay home,” Waitz announced on the first call. “It’s my sincere hope we get to spring break, but I don’t know if that will occur.”

By Monday night, it was clear it wouldn’t. At 7:45 on Tuesday morning, MIT made the call to end classes on Friday the 13th and send undergrads home for the rest of the semester. During that morning’s call, Stuopis compared MIT’s dorms—nine of which have more than 250 students—to cruise ships. Emptying them would decrease the density of people on campus to allow social distancing. (Grad students could remain, but those who could leave campus and work remotely would be encouraged to do so.) “We think this is the best way to preserve the health of every member of the community,” she said.

The decision would be announced later that day, leaving many questions to answer in the meantime. “There were a zillion implications,” Waitz says. He likens it to a technical problem that takes many steps—even though you know the answer at the outset. “We told them the answer: Okay, we’re going to move everyone off campus; we’re gonna end classes a week early. But we’re gonna end classes a week early. But there were 20 steps to solve that problem that we hadn’t yet solved,” he says. They had to sort out what the decision meant for things like financial aid, housing, and dining, and how to accommodate students who couldn’t safely return home. “We spent the day trying to solve the problem, which is a hard one, so we could write it down and get [the details] out to people,” he says.

One remarkable decision was that in addition to refunding housing and dining fees for the remainder of the semester, the Institute would convert the financial aid funds that would have covered housing and dining into cash payments that went directly to the students themselves. Waitz says that while it might have seemed odd to refund people money they had not paid, he and Stuart Schmill ’86, dean of admissions and student financial services, and Chancellor Cindy Barnhart, SM ’86, PhD
By late afternoon on Tuesday, students had received the email from President L. Rafael Reif saying Friday would be the last day of on-campus classes. Undergraduates were to leave by the following Tuesday and couldn’t come back after spring break. The rest of the semester would be taught online.

As the news sank in, a group of students gathered in Killian Court for an epic session of cathartic screaming. As someone hoisted a Purell dispenser in the air, dark clouds scudded overhead, mirroring the general mood. The semester would be finished from thousands of bedrooms scattered around the globe, not in the company of friends down the hall or fellow tacklers of impossible p-sets. “IHTFP” may have been carved into their brass rats, but no one wanted to spend the rest of the semester anyplace else.

On March 11, the World Health Organization declared COVID-19 a pandemic. Students packed up their rooms and said their goodbyes between their remaining classes as staff, faculty advisors, heads of houses, and GRAs worked tirelessly to help them move out.

On Thursday the number of COVID-19 cases in greater Boston had doubled and Massachusetts declared a state of emergency. All MIT employees who could do so were asked to begin working at home.

Waitz’s team realized that allowing students to stay until Tuesday was too risky. Suzy Nelson, dean for student life, said she could accelerate the plan to move them off campus, and Reif authorized the strategy at 6 p.m. Classes would be canceled on Friday; MIT would pay to store students’ boxed-up items and subsidize travel expenses to help them leave by Sunday night. As one ACWG-led group crafted a message to students to convey this, others were building a form for students to submit expenses and a ticket system to capture all requests. At 10:30 that night, they sent the announcement with a link to the form in an MIT advisory alert.

“We didn’t have positive cases, but people needed to leave, not hang out for five days and say goodbye to campus,” Waitz says. On Friday the 13th, all graduate students able to conduct their research remotely were asked to start doing so. On the 15th, PIs were asked to scale down on-campus research to achieve 10 to 20% of normal lab density by the 20th. This meant shifting to remote work whenever possible and allowing only essential research to continue on campus, such as lab work that would result in significant data and sample loss if discontinued, work to maintain critical equipment and safe standby mode in labs, and COVID-19 work that could address the current crisis.

Within a day or two, campus largely emptied out. All that remained were essential staff and about 200 undergrads who could not return home, some 1,300 grad students, and 500 partners, spouses, and children. In the span of a week, MIT went from deciding to move large lectures online to scaling back research and sending undergraduates and some 10,000 staff members home.

“It felt like we’d decide something one day, and the next day realize it was not enough. And then the next day, realize that that was not enough,” Waitz says. “Having people gone protected the safety of the MIT community and the community around us.”

“Two-thirds is okay” The early start to spring break gave faculty two weeks to plan for the suddenly remote semester.

With 1,251 classes all going online, beefing up the technical infrastructure was critical. Within days, Mark Silis, president for information systems and technology (IS&T), worked with his team to negotiate campus-wide licenses for Zoom, Slack, and several academic tools. They also boosted Dropbox allocations for file storage and worked with the Division of Student Life to get loaner laptops and Wi-Fi hot spots to students who needed them.

Meanwhile, chemistry professor and faculty chair Rick Danheiser had recognized the need to rethink MIT’s grading policies.
Not all students would be in environments conducive to learning. And faculty would be conducting classes from home, many teaching online for the first time with little time to prepare. Some would be juggling those duties with parenting responsibilities. Danheiser’s team concluded that it would be impossible to assign letter grades fairly under the circumstances. The Institute became one of the first schools to mandate univer/hyphen.case sal pass/no record grading for the semester/parenleft.case Columbia, Harvard, and others would soon follow/parenright.case. “It’s important that we focus more than ever on learning than grading, striv/hyphen.case ing to maintain classic rigor while worrying less about grades,” Danheiser explained in a virtual MIT town hall meeting on April 7. “We have to fundamentally trust in the motivation of our students.”

But faculty still needed to figure out how to teach classes remotely. MIT pioneered OpenCourseWare in 2002 and launched the MITx online learning platform in 2012, but even so, only about 20% of MIT faculty have developed courses for MITx, according to Rajagopal. “There are places at MIT where people have thought a lot about how to teach online really well,” he says. “But most of the 1,000 faculty had never thought about it/emdash.case and had to do it in two weeks.”

It wouldn’t have been possible to create high/hyphen.end video for all 1,251 classes. Departments would decide on their own methods, and faculty might have to improvise. Waitz advised a “pen knife and book of matches” approach—for example, taking pictures of lecture notes with a phone and sending them to students.

On March 11, his last day on campus, Rajagopal created a video in which he set expectations and offered advice to faculty. He told them that replicating their classes online at 100% with just two weeks to prepare was unrealistic—everyone would have to arrive at their own version of what he called “two-thirds is okay.” For many, that might mean ditching the traditional lecture.

While long lectures can work well in person, watching a 50-minute lecture over Zoom can be deadly. Rajagopal says it’s better to break online lessons into seven-to 10-minute chunks, whether they’re delivered
live or posted for students to view anytime. “Nobody can pay attention longer than that,” he says. And in live sessions, it’s important to mix in things that actively engage the students, such as breakout sessions or polls they can answer by holding up their fingers.

Sheryl Barnes, Open Learning’s director of residential education, and Janet Rankin, director of the Teaching and Learning Lab, ran webinars on remote teaching and pulled together a “Teach Remote” website of curated resources. (They also created a crowdsourced site letting anyone post best practices, such as tips for using Zoom with low bandwidth, and another curated website of remote-learning resources for students.)

MIT’s Digital Learning Lab (DLL) fellows, who help faculty members develop classes for MITx, also jumped in to help. The afternoon the decision to go remote was being finalized, Meghan Perdue, the DLL fellow for the School of the Humanities, Arts, and Social Sciences (SHASS), developed a two-hour crash course to help faculty shift their classes online. She then proceeded to give 15 workshops to SHASS departments in eight days, followed by a week of three to four small-group training sessions a day. She also shared her materials with DLL fellows elsewhere on campus so they could offer similar workshops.

Faculty got creative. Several departments took advantage of the fact that grad students were allowed to remain on campus after the undergrads left. Gloria Choi, an assistant professor of brain and cognitive sciences, sent TAs into the lab to do the rest of the semester’s experiments and collect data for the undergrad class 9.12 (Experimental Molecular Neurobiology). The TAs then scoured YouTube for videos of most of these classic experiments. When classes resumed, the undergrads were able to do their labs virtually by watching the videos and then using the raw data gathered by the grad students to do analysis and write lab reports. Likewise, some course teams in chemical engineering captured video footage of TAs doing experiments. And others, like senior lecturer Lodovica Illari, had already developed virtual lab tools. While students in her 12.307 (Weather and Climate Laboratory)

Polina Anikeeva, associate professor of materials science and engineering, normally takes what she calls an old-school approach to teaching 3.024 (Electronic, Optical, and Magnetic Properties of Materials): lectures at the blackboard, lots of discussion, office hours. But a few years ago, after the department decided to create online versions of all its core courses, she’d worked with the Office of Digital Learning to develop an MITx version. So when she and her teaching team learned that students would not be coming back after spring break, they figured that the class could easily be shifted online.

“The team and I thought, okay, it’s straightforward,” she told the ACWG in one of the 8 a.m. Zoom calls. “We have these beautiful materials, we have all the p-sets, we have all the projects planned out. All we have to do is meet with students and answer questions.”

But when the class met on Zoom to discuss the lectures they’d been asked to watch, it became apparent that none of the students had done so. No one wanted to talk, so she dove into her lecture using the whiteboard function on Zoom. The same thing happened the next time the class met, and the next. She polled the class and found that more than half the students actually preferred the live Zoom lectures.

“The overwhelming majority wanted to have their instructor awkwardly lecture in real time rather than watch the beautifully recorded resources we were so proud of,” Anikeeva reported. While the students appreciated being able to go back and watch the MITx lectures, what they valued most was “this ephemeral feeling that I’m lecturing just for them, not to the 2016 classroom,” she said. “They want their own experience that is ultimately created for them, and they’re willing to sacrifice the quality just to watch that immediateness.”

The trick, says Krishna Rajagopal, MIT’s dean of digital learning, is to blend the asynchronous and the synchronous: use great asynchronous material if you have it, but remember that students want the synchronous experience too.
2.007
Design and Manufacturing I

As Purell stations were being installed across campus in early March, 2.007 lab instructors were checking in with their students about what they hoped to get out of the robotics-centered Design and Manufacturing I class if they couldn’t continue meeting on campus. What they heard over and over was that not getting to build their robots would be a huge disappointment.

“A lot of students had come to MIT to take 2.007,” says Amos Winter, SM ’05, PhD ’11, co-teacher with fellow mechanical engineering professor Sangbae Kim of the class made legendary by the late Professor Woodie Flowers ’68, MEng ’71, PhD ’73, who conceived of its robot competition in the 1970s. As spring break approached and the prospect of finishing the semester on campus seemed less likely, the teaching staff assembled to rethink. “We tried to approach it as a design problem,” says Winter. That is, having talked to key stakeholders (chief among them the students), they outlined all the constraints and requirements, brainstormed possible solutions, and settled on a multipronged approach.

Rather than try to deliver live lectures over Zoom, they decided, they would post the lectures they’d recorded of last year’s class. But lectures, they knew, weren’t the most essential piece of the puzzle. “The real learning in the second half of the semester happens in the lab,” says Winter. As students build their robots, they’re working side by side with lab instructors in an apprenticeship model, gaining experience and building confidence.

Winter and Kim and the course staff shifted the focus from building a competition-worthy robot to having students improve their design skills by continuing to refine their robot designs. And without the pressure to build a functioning bot in time for the competition, they could create more detailed CAD designs, do things like analyze the impact of friction on the robot’s performance, carefully consider its power needs, and then predict how it would behave when built. Two weeks into the online half of the semester, Winter was enthusiastic about the students’ CAD designs. He’d just seen a student present a "fantastic" animation of a complicated mechanism she’d thought up while on campus—an idea he’d never seen anyone execute before. And having animated it, she was working on an in-depth analysis.

Once pass/no record grading was declared mandatory for the semester, Winter thought students might decide not to put a lot of effort into the class, since they’d finished seven of its 12 graded elements before break. “But I was dead wrong,” he says. “Students came back and embraced the opportunity—’Let’s get something out of this.’”

While eager to make the best of a difficult situation, the students still ultimately want to build their robots. So the department will offer a three-unit elective next spring to give students from this year’s 2.007 class an opportunity to actually create their bots—and test them out in competition.

Revamping 2.007 halfway through the semester was a challenge, but “constraints promote innovation,” Winter says. “We’ve been thrown a bunch of constraints we had never expected. It’s made us think in different directions and pursue different solutions we would not have thought of otherwise. And that’s not always a bad thing.”

Students couldn’t build their 2.007 robots, so Amos Winter (shown here) and Sangbae Kim shifted the class to focus on design.
class normally do weather simulation experiments in the lab to better understand the theory behind them, she was able to employ virtual weather visualization tools she and EAPS professor John Marshall and research scientist Bill McKenna had created for larger classes that rely on demos.

Some faculty who use blackboards extensively wanted to keep doing their lectures in empty halls. Barnes’s team supported that until campus access became limited, and only a few professors were granted permission. “Some of those classes involve really long equations,” Barnes explains. Those would be hard to fit in a screen as she put it, “There’s no substitute for eight wide blackboards.”

Others found ways to adapt at home. For his class in feedback system design, electrical engineering and computer science professor Jacob White created a makeshift lecture hall. He can scrawl on a whiteboard, levitate magnets, and annotate graphs from a live demo of a mildly unstable system as students watch and ask questions via chat.

“You might think the absence of the physical campus would make you feel the campus is important. But what’s important is the people in it.”

Unexpected benefits

At the first 8 a.m. meeting after classes resumed online on March 30, the discussion about how it was going wasn’t about system crashes or technical glitches. “All the IT worked,” says Rajagopal. “Instead, we had a 10-minute debate about pedagogy and good teaching practices.” And that same week, over 500 volunteer staff and faculty “success coaches,” who’d been recruited in a matter of days, began weekly check-in meetings with undergrads to offer support.

The remote half of the semester revealed some unexpected benefits of online learning. Rajagopal mentions one lecture class normally held in 26-100, in which no one ever raised a hand to ask a question. But students started using the chat feature in Zoom for just that purpose. A TA began monitoring the chat for questions and interrupting to let the professor explain things more clearly. That doesn’t mean classes should use Zoom on campus, says Rajagopal, “but it does mean that if you’re lecturing in 26-100, you’d better find a way to take questions.”

Barnes says some professors concluded that live lectures aren’t always the best use of the time faculty and students spend together. Assigning recorded lectures ahead of class allows more active engagement with students during class. “Mostly people don’t learn by listening,” she says, adding that giving students opportunities to practice the material and offering specific feedback provide the richest learning experience. “You might think the absence of the physical campus would make you feel the physical campus is important,” says Waitz. “But really it’s the opposite. You realize what’s important is the people who are in it.”

So as the spring semester wound down on laptops around the world, Waitz co-led a team planning for a range of fall scenarios, from bringing everyone back on campus (unlikely) to staying fully online (which no one wants)—and several in between, such as having half the students on campus for half the time. Students were asked to weigh in through a “We Solve for Fall” idea bank. A decision, based on public health guidance, was expected by early July.

Sanjay Sarma, vice president for Open Learning and a professor of mechanical engineering, spoke at the virtual town hall in April about how challenging it is to re-create the MIT experience online. “There’s a very special magic on campus,” he said. And then he gleefully mixed two geeky cultural references in a way that rang true to everyone glued to a computer screen instead of bumping shoulders in the Infinite: “Hogwarts is not the same without the wizards. And we look forward to seeing you all back here on the bridge of the starship Enterprise.”
Today, while half-listening to a guest lecturer’s voice fade in and out on Zoom over my choppy Wi-Fi, I sat down with my 11-year-old sister to show her how to reduce an improper fraction to its proper form. Frustrated, she asked why she had to do this, and I threw out some half-good reason like “You don’t want to fail the fifth grade.” I wanted to tell her about the importance of a strong foundation in math, to draw out the half-shaded and four-eighths-shaded pizzas to show that they are equivalent, explain that the line in the middle of a fraction just means “divided by” and that division and multiplication are so closely related to each other. But helping her understand that wouldn’t change the fact that her worksheet was due last week. Instead, I just showed her the steps involved and had her repeat them for each problem so she could finish and hand it in. While flipping through the calendar to figure out which of her assignments needs to be done when, I am painfully reminded of the passage of my own time, measured in less discrete units than worksheets.

It’s been one month since the last on-campus parties. A month since everyone rushed to book last-minute travel plans to somewhere off campus. A month since we all raced to pack up our rooms as Semisonic’s “Closing Time” played in the distance. I was in lab talking with a postdoc about the fate of our frozen cell lines during the imminent Building 68 shutdown while my peers carried Purell dispensers.
onto Killian. On that Thursday, I went out with friends to Miracle of Science on Mass. Ave. We bet on whether physical commencement exercises would take place, and whether MIT would swap out the guest speaker (the 2020s who’d been disappointed at the prospect of a commencement speaker from the military, with no discernible affiliation to MIT, had no idea how little it would all matter in just a few weeks). We reminded each other of where we were headed after all this (working in New York City, propping up the military-industrial complex in Hartford, grad-schooling in the Bay Area, doing whatever it is that Algorand does in Boston) and laughed at where we ended up and how we got there. That Sunday I said goodbye to Bob the house manager and the security guards before I drove the 18 hours from MIT to Birmingham, Alabama, all of MacGregor House room A111 packed into the back half of a rented minivan.

It’s been two months since I finished up my last set of grad school interviews, and three months since my first set. I remember being overwhelmed by socializing with important strangers, doing my best to balance the optional ask-a-current-student-don’t-worry-we-aren’t-judging-you panels with the mandatory do-these-readings-and-reflect-on-them assignments whose due dates overlapped with my interview dates. My biggest fear was that I wouldn’t get into any school and would have to endure the shame of asking for recommendation letters again next cycle; my second-biggest fear was of the inevitable awkwardness of my parents meeting my boyfriend’s parents at commencement when my parents didn’t (and still don’t) know about said boyfriend.

That commencement was supposed to happen a little over a month from now. I would be the first person in my family to earn a college degree, carrying my late grandmother’s name across a temporary stage in front of Lobby 10. If things had gone her way, she would have crossed a similar stage in Auburn, Alabama, about 50 years ago. But the walking-­across-the-stage part of commencement can’t happen this spring. A pandemic has robbed us of our pomp and circumstance. I’m going to get my degree in May nonetheless.

In my life on campus, I used to make to-do lists ordered by relative urgency. These lists would make it easier to visualize how much work I had instead of floundering around in busy inactivity. I tried to make a list last week to reorient myself into the MIT mindset and realized that the list had lost its magical ability to show me what my priorities should be. Instead, I made a second list, informed by the way my home maintenance duties (house cleaning, ad hoc homeschooling, meal preparation, mediation of disputes among the family pets) and personal maintenance activities (reading the news for at least an hour each day, exercising to remember what circulating blood feels like, disconnecting from any internet-­connected object to look at things that are more than 20 feet away in order to prevent myself from becoming even more nearsighted, attempting once again to convince my parents that the virus is something to be scared of) had shaken out since I came home. Surprisingly to my conscious mind but not to my heart, individual assignments for my classes were close to the bottom of the list. I am the lucky senior who managed to finish all my degree requirements last semester. Emergency Pass/No Record (P/NR) grading and the world’s most understanding professors (one of the many reasons I love the Comparative Media Studies department at MIT) have spared me an impossible choice: self, family, or transcripts?

Assuming nothing catastrophic happens, in the fall I will start at Berkeley, where I’ll spend the next five or so years effectively sheltered from the economic fallout of the pandemic. In the meantime, I am incredibly busy doing everything but schoolwork. Because regardless of how much time I have to spend washing dishes for my family of seven or how hard it is to keep my sister focused on worksheets or how many times a puppy bites me, being with my family right now is more important than the Zoom class I missed on Thursday.

I’m still working through some things, like the shame I feel asking for supplemental resources from the “Institute” and a relapse of major depression right when I thought it was gone for sure. I do not know what the next few months will bring. Nevertheless, I’m finding the dark humor in my horse-­shoe of an MIT journey, capped at both ends by semesters of P/NR and stressful application cycles.

I’m weeks from getting my degree, and I’ve never felt more like a freshman than I do now, blind to what the future holds but fighting to finish what needs to get done each day.
When my friends and I heard that we were all being kicked out of East Campus for the rest of the semester, only one thing still seemed certain in a world falling apart: we were staying together, no matter what.

It seemed like a pretty simple decision. East Campus was home to all of us in the deepest, truest sense; we renovate our own rooms, paint our own walls, cook our own meals, and build our own sense of family with each other. Even though I’d only been an MIT student for a few months, I’d found one of those families pretty quickly. It was devastating to even think of leaving each other behind, so we just … didn’t.

Cut to about a month later and here we are, nestled in a 100-year-old farmhouse in the middle of the Maine woods! We found out we had to leave on a Tuesday. By Sunday, we’d managed to find a house, acquire my car from Wisconsin, pack up all of our rooms, rent a 20-foot U-Haul, and transport the clothes, pets, plants, food, guitars, 3D printers, drones, soldering irons, fungal cultures, half-operational electric scooters, potassium nitrite, and bodies of 14 MIT undergrads to rural Maine. And although we can’t paint the walls or install our own flooring, we’ve created a sort of ad hoc version of the East Campus we know and love.

It’s hilarious to me how we automatically transplanted our dorm conventions to the new space, assigning “comms” committees, in dorm-speak— for different duties in the house. We have classic EC positions, like birthdayComm, which makes any treat you want on your birthday just so you can destroy it with a can opener or a butcher’s knife, and...
Kitchen Czar (that’s me!), who ensures that the kitchen and fridge aren’t absurdly disgusting. We also made some new ones, like Quartermaster. The Quartermaster made her own website to keep track of our food stocks, grocery requests, and communal expenses. You need an MIT Kerberos ID to log in. I didn’t know you could do that.

We’ve also brought some EC quirks just for the fun of it. We’ve named our two living rooms “G-lounge” and “Walounge,” after the two lounges in the Goodale and Walcott wings of the East Parallel. We transformed a walk-in closet into a maker space. A few of us have put MIT-like signs by our doors—amazing drawings, posters declaring the room’s “name,” lists of hobbies and academic interests. Sure, some of it’s a little pointless, but so is changing out of your PJs when you’re stuck inside all day. It just makes everything feel a little more normal.

The unfortunate part is that even though we’ve kept lots of the traditions that framed our daily lives at MIT, none of us can hide from the fact that all this is so, so far from what our “normal” really is. Back at MIT, I was never crippled by the extreme awkwardness and anxiety of attending virtual office hours. I never had to worry about working around egg and meat rations. I didn’t have to negotiate with landlords, or drive 18 hours from Milwaukee to Boston completely alone, or use my “adult voice” so the people at the town office would take me seriously. Last weekend I walked into Walmart wearing a full-on respirator and nitrile gloves, and no one gave me a second glance. Everyone gets it; I can’t risk bringing the virus home to the 13 people I loved enough to basically run away with. Although I can’t always consciously feel it, it bubbles up in these kinds of bleak moments: I’m always living in a little bit of fear.

When I tell people about my living situation, they generally say “It must be so hard to do your work with 14 people crowded into one house,” and yeah, it is. Quiet spaces are nonexistent, our Wi-Fi situation is a mess even with the help of IS&T, and there’s nowhere to be alone except for my car (which—trust me—is less than ideal). But for me, it’s not the number of people that makes every assignment feel like a battlefront; it’s that fear. Fear is exhausting. I used to take hard p-sets and poor test grades in stride, but now either one of those can send me reeling into despair. Having almost no structured schedule, no physical freedom, and no clear end to the pandemic can be so overwhelming to all of us that some days the best any of us can do is just watch a movie, show up for communal dinner at 7:00 p.m., and forget that 6.009 or 18.03 or JLab even exists. We’re all slowly learning that that’s okay, and maybe even necessary. I remind myself every day how lucky I am to weather these academic and psychological stressors with my friends; most MIT students are far less fortunate.

Like everyone else, we find a way to exist with uncertainty looming. For us, that means cherishing the one thing we didn’t have before: time.

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And, oh... what I wouldn’t give to just watch a movie, show up for communal dinner at 7:00 p.m., and forget that 6.009 or 18.03 or JLab even exists. We’re all slowly learning that that’s okay, and maybe even necessary. I remind myself every day how lucky I am to weather these academic and psychological stressors with my friends; most MIT students are far less fortunate.

Like everyone else, we find a way to exist with uncertainty looming. For us, that means cherishing a good amount of the one thing we didn’t have before: time. Every morning, I curl up on the same little blue couch in G-lounge to do my work, but only after I go on my morning run in the woods and make a nice breakfast. I explore beautiful hiking trails in the White Mountains. I sit by the creek to do physics p-sets. I write music for hours on end. One of my friends and I go on long drives late at night to look at the stars and remember to breathe. And I chat with my housemates about the things that keep them sane: writing books, painting, observing bacterial cultures, building drones, becoming doomsday preppers, all kinds of stuff. These conversations are usually the best part of my day, the same way they were back in Cambridge; they remind me that we will always find a way to hold onto ourselves, even under the weight of a 60-unit course load, or a new housing policy, or a global pandemic. Nothing, not even coronavirus, can sever us from who we are.
Since the covid-19 pandemic took hold in the US, most of us stuck at home have found that all the days seem the same. For Elazer R. Edelman ’78, SM ’79, PhD ’84, everyday is completely different—but all of them are long.

As the director of the MIT Institute for Medical Engineering and Science (IMES), Edelman has been tapped to direct the MIT Medical Outreach and Crisis Management Team. Initially the cross-campus group formed to collect donations of extra personal protective equipment (PPE) from around the Institute and distribute them to healthcare workers at hospitals, medical centers, and nursing homes in need. But soon the group also took on the task of...
marshaling MIT resources to develop and manufacture items like disposable face shields and perhaps even to develop a remote stethoscope. By May, the team was also contributing PPE to underserved populations and preparing to protect MIT community members with such gear when the campus ramps back up.

As a senior attending physician in the cardic intensive care unit at Brigham and Women’s in Boston, he has been stepping up his time at the hospital, working closely with his colleagues to treat critically ill covid-19 patients, many of whom are in cardiac and respiratory distress. And as a professor of medical engineering and science at MIT, and a professor of medicine at Harvard Medical School, he—like teachers across the globe—is grappling with the switch to online instruction and holding frequent virtual meetings with his students.

In early April, he also found time to make a cameo
Edelman recorded a message at Brigham and Women’s Hospital for a cameo appearance on the “Saturday Night Seder” show that was live-streamed in April.

appearance on “Saturday Night Seder”—a streamed event described by the New York Times as “part variety show, fundraiser, and theatrical experience” and featuring such celebrities as Jason Alexander, Sarah Silverman, and Bette Midler. (The comedian and writer Alex Edelman, one of his three sons, was the head writer for the show, which raised more than $3 million for the Coronavirus Emergency Response Fund of the CDC Foundation, a nonprofit that supports the Centers for Disease Control and Prevention.) The day after that aired, he and MIT mechanical engineering professor Martin Culpepper, SM ’97, PhD ’00, were jointly interviewed for NBC News about their collaboration to design disposable face shields that can be mass-produced quickly for hospitals nationwide (see “Protection on the cheap,” page 3).

“MIT has taught me not only to multi-task, but also how to use technology as a means to continue to embrace community,” Edelman says. In fact, while he’s saddened by the new pandemic reality, he says it’s been magical to see how the MIT community has risen to the challenge. He marvels at what he calls “the unprecedented collaboration taking place at MIT across all departments and roles—and with other academic institutions and medical centers—as the race to find an effective response to the pandemic continues.” During a campus-wide town hall meeting on Zoom in April, President L. Rafael Reif paraphrased a comment Edelman had made in a call as the pandemic dawned: “You said in that meeting, Elazer, this is what we are made to do. This is what our community was created for: to harness science and technology to improve the human condition.” And that, Reif added “is what everybody tries to do at MIT every day.”

While all routines are out the window for Edelman during the covid-19 crisis, his schedule for an MIT day might go like this: Waking before 6 a.m., he prepares for an onslaught of calls and emails before an early morning call with MIT leadership and faculty and researchers from all departments, who share their research updates and the challenges of managing a campus remotely. Then the day officially begins with online lecture and lab sessions for his graduate course on quantitative physiology of the cardiovascular system, followed by online student conferences, lab groups, and team meetings. He also spends a lot of time on emails or phone calls with MIT or hospital colleagues about covid-19 response efforts. And in between, he fits in running IMES, MIT’s hub for health science research, innovation, and education. Evening is for family, and often a late-night Zoom call such as a recent one with a group of alumni based in China, which is looking for ways to support the MIT efforts. When Edelman and Culpepper were first working on the face shield designs in March, the two often communicated into the early morning hours. “My calendar is a series of overlapping Zoom meetings and phone calls, interrupted by messages all characterized as urgent,” he says.

On days when he is leading the cardiac ICU team, there is even less “normal,” as everything else takes a back seat to patients’ life-and-death needs. “Attending in the ICU has always been a full-time affair. No night, no day—24 hours of concern,” he says. “With covid, we now must reinvent how we deliver care to the most vulnerable as well as protect the community, and this adds even greater challenge and responsibility.”

More efforts to meet the challenge have come from all corners of the MIT campus, Edelman says. It’s not just the faculty, researchers, and labs feverishly working on solutions; it’s also the facilities and procurement departments and the campus services team, in the mailroom and elsewhere, whom he calls “dominant partners” in all the projects under way. The PPE effort, for instance, involved more than 50 MIT departments, labs, and centers donating more than $43,000 in total pieces—including N95 masks, surgical masks, goggles, and swabs—to hospitals, clinics, medical centers, and municipal services such as the police and fire departments in Boston and Cambridge. “It is indeed amazing to see the impact of such wonderful people,” Edelman says. “I am so proud to be a member of this magnificent community.”

Even though he says he has never been so busy as he is now, he is also grateful for the increased time that physical distancing has let him spend with his family. “I get to spend more time with my father; I have greater connectivity with my brothers and with their families,” Edelman says. “I have seen much more of my wife and my children than I ever did before.” (His wife, Cheryl, and middle son, AJ, also happen to be MIT alumni, and his youngest, Austin, an MIT sophomore, returned home in March to finish the semester.) And in some ways, the quality of the time he spends with his students has increased as well. Before, he says, it was enough for them to know that he was in his office and for him to know that they were in the lab. Now that it takes a dedicated effort to meet, they are meeting more often, albeit virtually. Spontaneity may be limited, but their interaction is still satisfying and the quality of work hasn’t suffered.

And Edelman’s long days are unlikely to grow much shorter anytime soon. ■
On July 1, Charlene C. (Nohara) Kabcenell ’79 begins her one-year term as president of the MIT Alumni Association. A Hawaii native, she has lived in California with her husband, Derry Kabcenell ’75, since she graduated from MIT with a Course 6 degree. Kabcenell began her career at Xerox and retired from Oracle as a vice president of software development. A life member of the MIT Corporation, she has served on various committees for both the Corporation and the Alumni Association.

What aspect of volunteering for MIT do you find most rewarding?
I feel good about being able to connect other alumni back to MIT. When I retired from my career in the late ’90s, my husband and I hadn’t been to campus since our school days. Volunteering for MIT was an opportunity to find out what was going on there. It hit us then—we’d been missing out on so much. And naturally I couldn’t contain myself from telling alumni back home, “Did you know about this great project?” Often, it was something an alum might not know that MIT was involved in, such as addressing global poverty.

What will you focus on during your year as president?
My predecessors did a terrific job refreshing and strengthening the Association. My role is to keep the momentum going.

The covid-19 crisis has reminded us all of the importance of relationships and staying connected, both to MIT and to each other. I plan to focus on building and improving that connectivity, whether in person or virtually as we must do during social distancing, because we are such a force when we band together. The way we used to support each other as students, in getting through classes and whatnot—we can do the same now that we’re out in the world.

I also want to take advantage of our shared value of making a better world. “Mind, hand, and heart” has always been part of our MIT DNA, and working together to improve the world around us is a natural fit for our alumni community. Our collective response to the challenges of covid-19 is evidence of that, and the Association can do even more to inspire and facilitate those kinds of efforts.

In many ways, this ties to the work the MITAA Board of Directors has been doing with staff and volunteers to implement key tenets of the strategic plan we created in 2018, with special focus on activating our alumni network in service to the world—as well as to our local communities.

What did the MIT community mean to you as a student?
I don’t know who the nice people in the Admissions Office were who let me in, but I really feel like I was a long shot. I attended a public high school not known for academic excellence, where I was a nerd who just didn’t fit in. I was also a first-generation student. I arrived here knowing that I was not as well prepared as my fellow students.

Once I arrived at MIT, it was this big revelation: “There are other people like me! We speak the same language.” There were so many people here who shared those common values of love of learning and wanting to discover things and solve problems. In that sense, I think of MIT as my second home, certainly my intellectual home.

Do you have a favorite spot on campus?
The first time I walked up the steps to Lobby 7, I thought, “Wow! I can see the wear from generations of feet!” Later I found out that some of the original stones have been replaced, so perhaps it’s not quite generations of wear. But I still get that little thrill, remembering the first time going to class up those steps and saying, “I’m really here.”

Meet the president:
Charlene C. Kabcenell ’79

We used to support each other as students—and can do the same now that we’re out in the world.

By Nicole Estvanik Taylor
Alumni in the coronavirus conversation

As covid-19 spread this spring, the media turned to MIT-educated experts to make sense of the pandemic.

The virus

“I am very wary of simplistic projections about the ongoing outbreak based solely off of its current growth patterns.”

— MAIMUNA MAJUMDER, SM ’15, PhD ’18, faculty, Boston Children’s Hospital Computational Health Informatics Program, and research associate, Harvard Medical School (ARG News, March 16)

“Closing schools, bars, and movie theaters are good measures, but not enough. Our relaxed approach to social distancing is insufficient to stop the exponential growth of covid-19.”

— YANEER BAR-YAM ’78, PhD ’84, founding president, New England Complex Systems Institute (USA Today, March 21)

“The main thing we’ve learned is about how easily the virus is transmitted from person to person … This is clearly what makes this virus so much more dangerous than other viruses we’ve seen.”

— STANLEY PERLMAN, PhD ’72, professor of microbiology and immunology and professor of pediatrics, University of Iowa (Iowa Public Radio, April 20)

“The virus knows no borders … and here a concerning change is heightened mistrust among countries.”

— KATHLEEN HICKS, PhD ’10, senior vice president and director, International Security Program, Center for Strategic and International Studies (Politico, March 7)

“It’s not about how many more contact tracers do we need. It’s more about do we have the framework in place, not just in public health, but throughout society to be able to reopen.”

— SARAH PARK ’91, state epidemiologist, Hawaii Department of Health (Honolulu Civil Beat, May 8)

“Whereas 10 days ago there was some legitimate uncertainty about whether the global economy was in the process of going into recession—10 days later, there’s no question that it is.”

— DAVID WILCOX, PhD ’87, senior fellow, Peterson Institute for International Economics (CNN, March 16)

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— STANLEY PERLMAN, PhD ’72, professor of microbiology and immunology and professor of pediatrics, University of Iowa (Iowa Public Radio, April 20)

“It’s not the time to get boring, even in your planning. We have to be planning for exciting, important art, more than ever.”

— MICHAEL KAISER, SM ’77, chairman, DeVos Institute of Arts Management, University of Maryland (Washington Post, March 19)

“This pandemic has highlighted some of the many health-care disparities affecting communities of color, and reminds me that I must continue to use my voice as a physician to speak out against inequity.”

— KIAPPA JENPKA ’16, medical resident, Vanderbilt University (Forbes, May 5)

“I think there’s a lot of things that will come out of this. One is it will be a reckoning of the importance of evidence to guide policy.”

— ANUPAM JENA ’00, associate professor of health care policy, Harvard Medical School; associate professor of medicine and assistant physician, Massachusetts General Hospital (NPR, April 10)

The fallout

“Not all antibodies are created equal. We need to know what drives protective responses to the virus to help spur vaccine development.”

— ALBERT KO ’81, professor of epidemiology, Yale School of Public Health (New Haven Register, April 14)

“We’ve got up to 14,000 nursing students due to graduate this spring, and that’s a lot of nurses that we really need right now.”

— JOANNE SPETZ ’90, professor, Philip R. Lee Institute for Health Policy Studies, University of California, San Francisco (KQED, March 23)

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“Covid-19 is both a current emergency and a phenomenon that will have long-term effects on vulnerable populations and the viability of some of the nonprofits that serve them.”

— BARBARA FIELDS, MCP ’95, president and CEO, Greater Worcester Community Foundation (Worcester Telegram and Gazette, March 18)
Stanley Liu proposed the following as a speed problem, but I found the result very surprising and want to share it here. For more information see oeis.org/A0020024.

Consider the sequence 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, ... where the number \( n \) appears \( n \) times. It is fairly clear that the \( m \)th number ends at about the \( n^2 \) term, but I was surprised to see that term \( k \) is exactly \( \lfloor \sqrt{2k} + \frac{1}{2} \rfloor \).

Problems


This time you are to find a legal chess position where the player to move is in check and this player’s only legal move is to deliver checkmate. The mating move must be neither a capture nor a discovered check.

J/A2. Our next problem is a cryptarithmetic offering from David Dewan. I will give preference to solutions that are not computer searches of all the possibilities.

In the equation

\[ H A P P Y = N E W + Y E A R \]

you are to substitute a digit 0 to 9 for each letter. Distinct letters get distinct digits, and if a letter appears multiple times the same digit is substituted each time.

J/A3. We close with a geometry problem from Burgess Rhodes.

All lines intersecting at a fixed point in \( \mathbb{R}^2 \) fill \( \mathbb{R}^2 \). No two of these lines are parallel. Also, all lines parallel to a fixed line in \( \mathbb{R}^2 \) fill \( \mathbb{R}^2 \). No two of these lines intersect.

The question is whether \( \mathbb{R}^2 \) can be filled with lines no two of which are parallel and no two of which intersect.

Speed department

SD. Ermanno Signorelli wonders why computer scientists confuse Halloween and Christmas.

Solutions

M/A1. This “Turnary Reasoning” problem asks if the above position can be reached in a legal chess game and, if so, whose move it is.

Rich Downey shows that the position cannot be legally reached by showing that no “last move” could have resulted in the given position. Specifically, Downey asks separately if each piece could have made the last move.

—The White king: No. For any of the six squares the White king could have moved from, it would have been in check. However, there is no previous Black move that would have put the White king into check. Thus the White king would have been in check after White’s last move.

—The White rook: No. There is only one square the White rook could have moved from. However, if it had been there, the Black king would have been in check after Black’s previous move.

—The Black pawns: No. Five of them have never moved, and the sixth could not have moved from the square where the White rook is.

—The Black queen: No. Any of the three squares it could have moved from would have had White’s king in check after Black’s previous move.

—The Black king: No. It could not have moved from the square adjacent to the White rook, since the rook would have been there first, and hence the Black king would have been in check after Black’s previous move. It could not have moved from the square adjacent to the White king, since kings can never be adjacent.

Send problems, solutions, and comments to Allan Gottlieb at New York University, 60 Fifth Ave., Room 316, New York, NY, 10011, or gottlieb@nyu.edu. For other solutions and back issues, visit the Puzzle Corner website at cs.nyu.edu/~gottlieb/tr.
M/A2. In this “modest polyomino” problem from Richard Hess and Robert Wainwright, you are required to design a connected tile so that six of them cover at least 93% of the area of the pentomino given below. The tiles are identical in size and shape and may be turned over so that some are mirror images of the others. They must not overlap each other or the border of the pentomino.

Joe Catling’s solution (below) begins by dividing each of the five squares in the original figure into nine sub-squares, giving 45 subsquares in total. He then defines a seven-sub-square tile and places six of them as shown. These six tiles cover \( 7 \times 6 = 42 \) sub-squares, which have a total area equal to \( 42.45 \times 93\% \) of the area of the original figure. The three sub-squares not covered are highlighted in the diagram.

M/A3. Lee Giesecke presents a venture into astronomy and 3D geometry. Imagine it’s the winter solstice and you want to compute the geocentric and geodetic latitudes of the Arctic Circle and the Tropic of Capricorn. The geocentric latitude gives the angle between the equatorial plane and a line from Earth’s center to a point on the surface. The geodetic latitude assumes a line from the equatorial plane and a line from Earth’s surface. The angle of intersection of the line with the surface gives the geodetic latitude. Assume Earth can be represented by an ellipsoid of revolution with the semi-major and semi-minor axes \( a = 1 \) and \( b = 0.99665 \), and that Earth’s obliquity (axial tilt with respect to the ecliptic) is 23.44°.

When I selected this problem, I felt it was quite interesting, but also challenging. I was pleasantly surprised that I received three carefully prepared solutions. Well done, readers! Greg Muldowney’s solution is below; those from Joe Catling and Burgess Rhodes are on the “Puzzle Corner” website at cs.nyu.edu/~gottlieb/tr.

As described, the Earth is slightly larger across the equator than between the poles. In terms of \( x \)-\( y \) coordinates fixed at the center and the semi-axes \( a \) and \( b \), the surface of the Earth is the ellipse \( (x/a)^2 + (y/b)^2 = 1 \). The ellipse is also tilted by \( \epsilon = 23.44^\circ \) versus the plane of orbit around the sun.

At the winter solstice, the Arctic Circle corresponds to the greatest latitude above the equator at which the sun is visible, while the Tropic of Capricorn is the greatest latitude below the equator at which the sun appears directly overhead. Thus the geocentric latitudes are \( \theta_{AC} = (90 - \epsilon) \) or 67.56° north, and \( \theta_{TC} = \epsilon = 23.44^\circ \) south. These two latitudes have associated surface points \( (x, y)_{AC} \) and \( (x, y)_{TC} \) respectively, at which \( (y/x) = \tan \theta \).

For geodetic latitude, the slope of the surface tangent at \( (x, y) \) is found by differentiating the ellipse equation implicitly to give \( 2x/a^2 + 2y(dy/dx)/b^2 = 0 \), thus \( (dy/dx) = -b^2x/a^2y = -(b/a)^2 \cot \theta \). A line perpendicular to the surface at \( (x, y) \) therefore has a slope of \( -1/(dy/dx) \) or \( (a/b)^2 \tan \theta \). This slope is exactly the tangent of the geodetic latitude \( \phi \), hence \( \phi = \tan^{-1}[(a/b)^2 \tan \theta] \). Applying this relationship at \( (x, y)_{AC} \) and \( (x, y)_{TC} \) gives:

\[
\phi_{AC} = \tan^{-1} \left[ \frac{a}{b} \tan \left( \frac{\pi}{2} - \epsilon \right) \right] = 66.70^\circ \text{ N}
\]

\[
\phi_{TC} = \tan^{-1} \left[ \frac{a}{b} \tan (\epsilon) \right] = 23.58^\circ \text{ S}
\]

The geodetic latitudes slightly exceed the geocentric latitudes, consistent with Earth’s greater equatorial versus polar dimension.

Other responders


Solution to speed problem

Because computer science types know that 31 Oct = 25 Dec (i.e., 31 base 8 = 25 base 10). Recall that speed problems are “often whimsical.”
Profiles in generosity

Jim Alder's 40th reunion in 2012 marked a new era in his involvement with MIT. He began to volunteer as an educational counselor, and he and his spouse, Muguette, made their first planned gift to the Institute, a charitable remainder unitrust (CRUT) through the Office of Gift Planning. The couple has since also established endowed scholarship and graduate fellowship funds.

The flexibility of planned giving. A CRUT provides income to donors and their beneficiaries. When it terminates, the gift goes to a designated cause at MIT—scholarships, in the Alders' case. “Supporting scholarships is especially important to me, as I had financial issues while at MIT,” says Jim. He and Muguette reevaluated their giving in 2019 and terminated the CRUT, having learned they didn't need the additional income in retirement, which gave MIT access to the funds sooner. They also invested in an MIT donor-advised fund (DAF). “Establishing a DAF was a logical next step,” says Jim. “Our current plan is to accumulate money in the fund over the next several years, then give most of it to MIT.”

Supporting students. The Alders suggest that for those considering a gift to MIT, a CRUT through the Office of Gift Planning is a great starting point. “Attending MIT events and listening to students’ incredible stories and achievements are what made me want to get more involved,” says Muguette. Jim agrees: “Hearing from MIT students will tilt you pretty quickly toward the advantages and the value in the money you will donate, no matter what type of gift you make.”

Help MIT build a better world. For more information, contact Amy Goldman: 617.253.4082; goldmana@mit.edu. Or visit giving.mit.edu/planned-giving.

James ’72 and Muguette Alder
Boerne, Texas

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