



# The Tech 2019 Year in Review

Dear readers,  
Many of us students don't measure the passage of time by the incrementation of the calendar year. We are instead engaged in a perpetual march towards (we hope) graduation, marking our progress with each satisfactorily completed problem set, checked off requirement, foregone opportunity...  
*The Tech* is printed every Thursday, but crises evolve in fits and bursts. Change seldom just hap-

pens; it trickles. And no matter how many emails we send, the world does not run on our publication schedule.  
The yearly review of a weekly newspaper that covers a community in constant motion is inevitably peppered with gaps. If you identify any that you would like remedied in our next volume, please, let us know.  
Speaking of arbitrary windows of time, 2019 also marked the end of

the decade. (Caveat: Google "when does the decade start and end?")  
As I look through the major stories from our archives, I am most struck by the changes in undergraduate housing: in the past ten or so years, administrators opened Maseeh; demolished Bexley; disbanded Senior House; and, in recent months, eliminated "mutual selection" from room assignment procedures. What will happen to the cultural landscape of MIT's dormi-

tories next? Many of us are nervous to find out.  
Money — where it's from and where it goes — also dominates the MIT community's discourse, whether it be the post-2009 recession budget cuts, the 2015 decision not to divest from fossil fuels, or the Epstein scandal that has rocked 2019 and beyond. As MIT reckons again (Koch) and again (Saudi Arabia) and again (Schwarzman) with its funding sources, our conversa-

tions about MIT's ethical responsibilities must continue to evolve, too.  
Things are always brewing, but rather happily, I will be retired from my editor duties before the next implosion. In the meantime, I intend to learn about MIT happenings as I hope some of you do: by picking up the latest edition of *The Tech*.  
—Jessica Shi '21  
Volume 139 Editor in Chief





better yet, that you would like to write about  
— just send us a note! We await eagerly at  
cl@tech.mit.edu.

— Jessica Shi '21  
Volume 139 Editor in Chief

# Sometimes in lectures, instead of learning, I am freaking out

**By Yingni Wang**

My friend next to me noticed my distress, and asked, "Everything OK?" I told her in the lightest whisper that I had just gotten my period. She asked her neighbor if she had a tampon or pad so I could still come back to lecture after addressing this emergency in the bathroom. But her neighbor didn't. There were more shoulder pokes and whispers, propagating through the large lecture hall. Now, instead of paying attention, 10 girls were briskly searching through their backpacks, hoping to find a spare tampon or pad to my rescue. One of my guy friends clearly felt excluded from this covert operation. After he insisted on knowing, I told him, and he suggested, "You should just bring them all the time!"

On a different continent and many time zones over, I, along with almost 50

It doesn't make sense.  
Yingni Wang is a member of the Class of  
2020.

# 101 things to do before you graduate

## Participate in a UROP

I'm a junior now, and thinking about grad school applications sometimes brings this memory back. My supervisor probably didn't have to reassemble an entire computer cluster to complete his thesis, nor did such a task relate to his research, but he did it anyways. In five years, could I have the maturity to give my all to a project like that? Perhaps I won't know unless something like that hits me, so until then, I'll continue along my trajectory, per Newton's First Law.

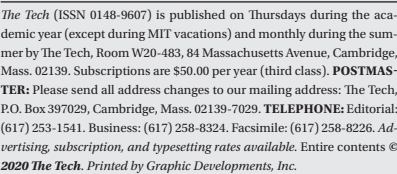
# Drive through Boston/Cambridge

The intersection light turned green. I still didn't trust myself, but I'd have to learn to do so. I made the turn, and I drove all the way to Maine.

—Chloe Yang







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# MIT's policies force many graduate students to live in poverty

*Threatened with eviction, forced to forgo medical care, and living in fear for my family: my life at MIT*

**By B. Mano**

“You’re lucky to be here.”

The words from the MIT administrator hung in the air. I did feel grateful to study at MIT and receive a world-class education that hopefully one day would help me become an academic. But I was trying to explain to this administrator how unbearably difficult it is to pay my MIT bills while supporting my partner and child on an MIT graduate student's stipend. And here I was, a day late on clearing my balance, being told to feel grateful.

Those words hurt, but they were neither unique nor surprising. MIT administrators have been consistently dismissive towards my tenuous financial situation — a situation created by MIT's own policies that, as I will describe shortly, make surviving as an international graduate student with a family a nightmare.

Indeed, at one of the wealthiest universities in the world, in the richest country in the world, I have been pushed to live near the poverty line for many of those years. Through its policies, both big and small, MIT has made my life as a graduate student financial torture as I struggle to complete my studies. I have been threatened with eviction. I have been forced to forego essential medical care for my spouse and myself. And I have nearly dropped out of school entirely because I could not afford to remain.

Given U.S. laws disallowing my spouse to work, I am meant to support my family — my partner and child — on my graduate student stipend. Put differently, my graduate stipend is not just my own salary; it is my family's income. Unfortunately, MIT's own policies make it nearly impossible to live on a \$30,000 salary.

While housing costs in Cambridge are astronomical for everyone, MIT does little to help international students who are limited by law in how much they can work. The U.S. Department of Housing and Urban Development defines those who pay more than 30 percent of their income for housing as cost-burdened. Those who pay 50 percent or more are severely rent-burdened. Towards my MIT housing, I pay about 70 percent of my family income for rent. And this is the cheapest option that my family qualifies for. MIT provides no additional subsidy, even for students in its own housing. As a result, I live in “shelter poverty”: unable to meet my basic needs because of extraordinarily high housing costs.

Given how I have to monitor money, I have occasionally been a few days late paying the registration. One time, after being three days late, I was charged a \$100 late fee and was threatened with eviction if I did not pay. This, by an institution that has, by its own rental structure and stipend amount, forced me into this position of stretching every dollar.

As if these housing costs weren't bad enough, MIT's exorbitantly expensive family health insurance plan (\$400 per month) puts further strain on my family. Then there is the seemingly minor — but for people like me, huge — \$50 per month student life fee. That leaves us with less than \$60 a week to pay for food, transportation, and any other costs that may arise — including co-payments.

While there have been crucial steps taken over the past two years by the Division for Student Life, including the Family Food Grant, TechMart, and the SwipeShare program, MIT has made a series of unfortunate changes to its policies that make even living on that amount all but impossible — policies that, had students living paycheck to paycheck like myself been consulted, perhaps never would have been made.

Two years ago, for instance, MIT doubled its co-payment for emergency room (ER) visits outside MIT Medical to \$100. Soon after, they cut the hours of the MIT Urgent Care to half a day (8:00 a.m.–7:30 p.m.), with even more limited hours for pediatric services, especially on the weekend. Even in those limited hours, the pediatric service is not usually available, and I am almost always told by Pediatrics to either visit an ER outside MIT or file a complaint with MIT Medical.

One particularly harrowing story illustrates how these changes have impacted our family. A few months ago, for instance, my child had a high fever. We called MIT Pediatrics and explained the situation. They said there was no schedule available and that we should take our child to the ER at the Children's Hospital. At Children's, the doctors emphasized that if the fever didn't subside by the next morning, my child should see her doctor at MIT Pediatrics. We tried to schedule an appointment at MIT but were told no time was available. My child was in pain with red rashes all over her body, so we did what any normal parent would do: took her back to the emergency room. Going back to MIT a third time, we were again told no appointment was available — and so went back to the emergency room for the third time.

Thankfully, my daughter got better within a week, but the effects lingered. That episode caused incredible stress for my wife and me over my daughter's health. In addition, given MIT's policy changes, I had to pay \$300 just in co-payments — more than my entire budget for a month. MIT must do better to ensure its own students can afford health care for their families.

As a result of these seemingly small and externally-caused changes, I live in fear of the weekends. Why? Because — terrible as it sounds — I feel anxious that my child might require medical care, resulting in co-pays that I cannot afford. So while everyone else is looking forward to a couple days off, each Friday afternoon is a portent of fear for me: what do I do if my child needs to go to the hospital?

My spouse and I never go to the emergency room on the weekend, even if we have to deal with the pain and illness until Monday morning. But we cannot do the same for our child. So when a friend kindly says, "Have a great weekend, long-weekend, or holiday," that simply means to us, "Hope your fears won't come true this weekend."

We always prioritize the health needs of our child. But as a result, our own health deteriorates. I cannot purchase a pair of eyeglasses that MIT Medical has emphatically recommended me to wear for two years now, nor can we seek dental care that we need, because these medically-necessary items have turned into “luxury goods” for us. Any parent would make such sacrifices for their children. This is the level of sacrifice I make every day.

MIT made these changes without consulting the students that would be impacted the most by them. And so, one of the wealthiest universities in the world is forcing its own students to put off essential medical care in order to save for co-payment costs of their children.

Living under this financial strain brings a toll on my mental health and that of my family — questions that MIT never asks in its multiple surveys of, and gestures for, students' mental health. There have been questions of how a student's family health may impact their financial situation, but MIT should recognize the reverse.

I have received tremendous support from my own department (DUSP) and have had only those caring staff and my incredibly supportive advisor to turn to. But unfortunately, the MIT administration, despite my multiple requests of them over the past six years, has not shown even a tiny portion of the same support. Even worse, MIT has often

passed my stories to my department people despite my having shared them in private.

The attitude of “you’re lucky to be here” or “you’re responsible for your ordeal” is pervasive wherever I turn to. For example, when I asked an MIT administrator to waive the punitive hold-fee to register for the next semester because I was only one week behind in paying my balance, they shouted at me in a crowded room: “MIT is not a charity organization. Channel your indignation to other offices that should deal with that!”

Embarrassed, I went to the other office they recommended. There, I was asked a range of disturbing and very personal questions cloaked in kindness and concern. "The Institute has always been very clear about the living costs that you should expect as a student, yet you have accepted the offer of admission and, worse, had a child, knowing that you will face difficulties meeting these costs?" Again, I blamed myself and left the room.

I understand the MIT policy (section 8.3.1) that “stipends are not intended necessarily to cover the full cost of living.” But how can students like me survive, let alone remain sane, when the current stipend covers at most a quarter of the living expenses that MIT itself has calculated? This is particularly dire for international students, especially those coming from low-income countries, who cannot seek public subsidy programs or non-private health insurance due to the current U.S. administration’s policies. Seeking public services while on a non-immigrant visa would disqualify us from obtaining immigrant visas afterwards.

Yes, I have fears for my future, but I also hope for the future of my family as well as the future of others. So, I share my story so other graduate students know that they are not alone in their suffering, that they can be heard as well. And if doing so comes at the cost of my bearing the ignominy of financial predicament, then let it be.

Yes, I feel lucky to be here. And I am proud that I try to study hard while sometimes — when legally allowed — working four jobs to provide for my family. But I also feel that as students, we deserve better. I feel that MIT needs to live up to its reputation as one of our world's finest universities by treating its graduate students with the respect they deserve.

*B. Mano is a shortened name of the author (bmanouch@mit.edu), who would like to preserve some online anonymity for personal reasons. Please reach out to grads4healthymit@gmail.com to follow up on the piece or Graduate Students for a Healthy MIT's campaign.*

## STAFF COLUMN

# Who deserves to be a philanthropist?

*The conversation surrounding David Koch's death should help us rethink charity*

**By Mark Goldman**

*STAFF WRITER*

After multibillionaire and MIT Corporation lifetime member David H. Koch '62 passed away last week, media outlets exploded with reports on this passing of the 11th richest person in the world, who according to Forbes had a net worth of \$50.5 billion in March 2019. Many of these accounts emphasized the numerous contributions Koch made to different causes which, according to the Koch Family Foundations website, amount to \$1.2 billion dollars. MIT News quoted Robert Millard, chair of the MIT Corporation, who stated, "David Koch was a model philanthropist who funded initiatives across a swath of cultural, scientific, and medical institutions."

I am troubled by how we choose to bestow titles like “model philanthropist” and the impact this labeling has on the way our generation and future generations choose to help others. While Koch’s donations were large in absolute terms, they made up a small proportion of his total wealth. If we assume the Forbes and Koch Family Founda-

tion numbers are correct, then at his passing, Koch had donated about 2.3 percent of his total wealth. This is slightly lower than 2.6 percent, which is the average amount of income households in the US give. While this comparison is not perfect (since unrealized capital gains are included in wealth but not in income), it suggests that Koch was around average in his generosity relative to other American households.

Many better examples exist. Mark Zuckerberg and Priscilla Chan have committed to giving away 99 percent of their Facebook shares. Bill and Melinda Gates have committed practically their entire net worth of \$90 billion to humanitarian causes. In fact, there are over 200 billionaires who have committed to giving a majority of their wealth away, often to causes that lift up society's most vulnerable populations. Why should mediocre be our model?

Philanthropy, literally “love of humanity,” should also be based on the intention behind and the impact of a donation. Donating to causes that would benefit people more different than oneself, like donations from North America going to research on

neglected tropical diseases, which the Gates Foundation supported, might indicate a wider sense of empathy (and therefore a love of all humanity) than if one primarily donated to their alma mater and to political ideologies they agreed with.

In addition, a model philanthropist would want to ensure all of their actions support a better world. For example, the benefit of funding a cancer research institute, like Koch did at MIT, might be offset by sitting on the board of the Cato Institute, which Koch also did, as it advocated for weakening regulations of airborne particulate matter, which the World Health Organization estimates causes 29 percent of lung cancer deaths worldwide. Despite his intentions of helping understand and cure cancer, his other actions may have inadvertently created more of it. A more effective donor would be willing to change their job, investments, and lifestyle to better align with the initiatives that they support.

At MIT, we should encourage people to give money to benefit society, but also hold these potential donors to high standards. When we decide to publicize a donor, we

should stipulate exceptional generosity. For example, MIT could make a policy that to get a named building, one must show they consistently donate to beneficial programs at least 12 percent of their annual income, which is the average donation amount from American households that earn less than \$25,000/year. We should expect even more from these donors, given they have a larger fraction of disposable income than those living below the poverty line.

To ensure upstanding moral characteristics of donors, MIT needs a working review process for would-be donors, which can be done in two parts. First, MIT should reduce conflicts of interest, increase transparency, and eliminate overlap between review stages when evaluating high-risk foreign engagements, as highlighted by an editorial in the Faculty Newsletter. MIT could then expand or adapt this effective review process for donations or grants above a certain threshold. By setting high expectations for donors, MIT can tell the world that with great monetary power comes an even greater obligation to help others.



GUEST COLUMN

# Seth Lloyd should continue teaching at MIT

*We should not assume the worst of our professors when they apologize and try to make amends*

By Rion Tolchin

By now we're all aware of the Jeffery Epstein scandal and the public apology letter Professor Seth Lloyd released on Medium. Specifically, there have been two guest opinion articles published in *The Tech* thus far calling for Professor Lloyd to be removed from his position teaching the class 18.435 (Quantum Computation) because of his involvement with the situation. As a student who is also taking the class and was present for the MIT Students Against War (MITSAW) protest, I want to share my own thoughts on the matter since, up until now, only one side of this controversy has had its voice made public.

The escalation of this issue to its current state started with the article "Seth Lloyd should not be teaching at MIT," which condemned Professor Lloyd for his handling of the Jeffery Epstein topic in class. Essentially, Professor Lloyd took the beginning of the first lecture of 18.435 to discuss the Epstein issue in an attempt to inform us students and address any concerns that were brought up. No one voiced any concerns in class (I know I personally wanted to take more time to mull over my thoughts on the matter), so Professor Lloyd then clarified that if anyone wanted to voice their concerns privately, they were free to email him or set up a meeting. It seemed to me that Professor Lloyd was genuinely trying to make sure that the students were up to speed on the matter and felt like they could be heard or be safe in class. That said, the attempt was evidently not successful, since a student soon after dropped the class and then later published the article calling for Professor Lloyd to be fired.

I think it's incredibly unfortunate that, in an attempt to be forthright, Professor Lloyd discussing the issue may have made some students (at least one) feel even more alienated and uncomfortable with being in the class. During the protest, Professor Lloyd explained that he too wishes he knew better what could have been done to make students feel safe; he did offer a trigger warning and also mentioned that students should feel free to leave if they felt uncomfortable with the topic. It could be seen as somewhat unfair to expect students to leave the class in a conspicuous way. However, I don't think that it's accurate to say that he was overly inattentive to his students' feelings by bringing the topic up. He has been condemned for discussing the topic in class and for asking students how they think such a topic should be handled. But the point of him doing so was to clear the air, and to that end, I think being open about the topic was the best course of action for him to take for the sake of us students.

It is still regrettable that not everyone felt comfortable in the class, and those students' emotional responses are completely valid. However, I don't think dropping the class was necessary, since he and the TA would have worked with students who had concerns. For example, when I have been forced to miss class I was able to email the TA and receive class notes and problem set problems. Therefore, I don't think it stands to say that Professor Lloyd being the teacher of the class bars women or the morally opposed from taking it. I think students would be accommodated if they felt incapable of being in the same lecture room with him.

The second article was written by MITSAW. However, the article was in reference

to the protest that occurred and the greater context of Seth Lloyd as a professor. The general idea of the piece seemed to be that, by allowing Professor Lloyd to continue teaching, the Institute would be making the statement that it wished to brush the issue under the rug and has no regard for marginalized student groups. This is, in my opinion, actually the exact opposite message that would be sent. I am immensely concerned with the precedent that removing Professor Lloyd from his position would set.

As I see his intentions, the point of his initial apology and of him bringing to attention his past actions was for Professor Lloyd to take public responsibility for what he saw as a mistake of moral inattention. As he has said before, he did not see receiving Epstein's money as a directly wrong action, but once he realized that he had inadvertently bolstered the man's social network — legitimizing him and making it more difficult for his victims to speak out — he felt an immediate need to apologize. I agree that it was wrong to have accepted Epstein's money, but I respect the fact that he publicly apologized and has been taking ownership of his decision.

The Goodwin Procter fact-finding is still ongoing, so calling for immediate action seems unreasonable. Until the investigation is completed, we have to assume that only the currently known facts are true, and given those facts, Professor Lloyd's involvement was minimal and his handling thus far has been fair. Our community should respect the standard of innocent until proven guilty. The calls for his removal claim that, by waiting for the investigation to conclude, the administrative staff would just be trying to sweep the issue under the rug. However, I

think that is precisely what would be shown if he were to be removed — that the university will distance itself from this scandal at any cost, with no regard to the moral implications of such a decision.

Students' emotional safety is a hot-button concern right now (and a legitimate one), but no one that I have talked to is concerned with making sure MIT is a place where the faculty and staff feel safe to take responsibility for their moral fallibility as humans and to make amends for any mistakes they have made. How can MIT expect to avoid catastrophes like this Epstein situation in the future, if it incentivizes faculty not to confront and apologize for any moral failings they feel they have been involved with? And how can this institution try to produce students that hold themselves to moral standards if it enacts precedents that dissuade our professors — our role models — from even discussing moral issues as they experience them in their own present-day lives?

I don't want to wake up one morning and find myself attending an MIT where the student-professor relationship has become sterilized to a mere exchange of information, void of humanity or experiential insights. Right now, we as students do have the power to push for the policies, committees, and most importantly, the precedents that we want to be set. Let's aim for the right ones. Retribution is not the answer. As members of this community, we must be empathetic to each other and to the faculty and staff, if we can hope for this situation to be rectified in a constructive manner for MIT going forward.

*Rion Tolchin is a member of the MIT Class of 2022 studying physics.*

GUEST COLUMN

# Celebrating war criminals at MIT's 'ethical' College of Computing

*MIT claims that ethical considerations will be central to College of Computing's work, but its actions have suggested otherwise*

On Feb. 26–28, MIT will celebrate the opening of the Stephen A. Schwarzman College of Computing, named after the CEO of the Blackstone Group (the largest private equity firm in the U.S.). Schwarzman, who has a net personal worth of over \$12 billion, invested \$350 million in the initiative.

MIT claims "ethics" are integral to the college's mission. MIT President Rafael Reif declared that, "As computing reshapes our world, MIT intends to help make sure it does so for the good of all." Schwarzman said that "attention to ethics matters enormously" to him and that "we will never realize the full potential of these advancements unless they are guided by a shared understanding of their moral implications for society."

However, the MIT administration's conduct has been anything but "ethical." First, there is MIT's willingness to accept Schwarzman's money, for which it has already been criticized. Concerns about Schwarzman are far ranging, from being an advisor to Donald Trump to heading the Blackstone Group that spent millions opposing an affordable housing ballot measure in California. Last spring, Schwarzman hosted the Saudi Crown Prince Mohammed bin Salman (MBS) — a war criminal in charge of a repressive monarchy — after Blackstone received a \$20 billion investment from his government. All the while, millions of Yemenis are suffering from starvation and disease as a consequence of the U.S.-backed, Saudi-led coalition's assaults. MBS also has an extensive record of human rights violations at home, jailing and silencing activists (including women fighting for the right to drive). His government also persecuted Saudis across the globe who

speak out against his policies (or who simply attempt to seek asylum elsewhere).

Schwarzman's alliance with the Saudi crown prince represents an agenda of profit at any cost, a far cry from the pious statements about "ethics" pronounced in public. Schwarzman's vision is perhaps better captured by his 2011 remarks equating the Obama administration's plan for a minor increase in corporate taxes (raising the "carried-interest tax") to Hitler's invasion of Poland.

We should note that it is not just Schwarzman who has ties to MBS. Last spring, MIT officials also received MBS as an honored guest and extended numerous partnerships with his government. The upcoming celebrations only add insult to these injuries.

One of the slated featured speakers for Feb. 28 is Henry Kissinger, whom MIT invited — and whom Schwarzman sees as a role model for U.S. foreign policy — despite his role in multiple atrocities worldwide. During his long career, Kissinger backed Indonesian dictator Suharto who, aided by U.S. intelligence, murdered up to a million of his own people. With Kissinger's backing as U.S. Secretary of State, Suharto also invaded East Timor in 1975, which led to the deaths of over one hundred thousand East Timorese. In Chile, Kissinger spearheaded the Nixon administration's successful efforts to topple the democratically elected government of Salvador Allende and install Augusto Pinochet's brutal military dictatorship.

In addition to his well-known role in prolonging the Vietnam War, Kissinger also orchestrated secret bombing campaigns in Cambodia and Laos. More bombs were

dropped on Cambodia and Laos in those years than the Allies dropped on their enemies during all of World War II. To this day, unexploded bombs threaten the lives and livelihood of people in these regions. However, Kissinger remains unrepentant for his role in bloody invasions, bombings, and coups.

For the MIT administration, as for Schwarzman, money trumps concerns for human rights and economic justice. It is only fitting, then, that political commentator Thomas Friedman was also invited to speak at the upcoming event — as Friedman's writing was pivotal in creating MBS's image as a "reformer" in the media. This narrative distracted from MBS's responsibility for atrocities in Yemen, which mainstream U.S. media only started seriously covering after columnist Jamal Khashoggi's murder by a Saudi hit squad. In spite of criticism from students, faculty, and the local community, the MIT administration has refused to cut ties with the Saudi government or acknowledge the depth of the harm in its continued relationship. Similarly, regarding the Schwarzman College, the administration has also failed to address numerous questions from students and faculty about the college's direction and focus. Rather than engaging with the community, the administration adopted an uncritically "celebratory" tone towards the college's opening that caters to donors.

But how can we celebrate a college claiming to lead ethical, thoughtful research when war criminals such as Kissinger are invited to speak? When the college is funded by the CEO of a company that accepts billions of dollars made by waging

devastating wars on civilians? When MIT invites former Google CEO Eric Schmidt, who famously dismissed the very idea of privacy and the abusive powers of surveillance, to help guide "ethical" computing research? Or when MIT, in the height of cynicism, picks Thomas Friedman to moderate a panel on "Computing for the People?" How can we believe that this new college will take justice, ethics, or morals seriously, given the figures MIT has chosen to represent the endeavor?

Underlying the whole of this is MIT's growing quest for private sponsorship, military contracts, and the wrong kind of prestige. Rather than promoting thoughtful discussion about the direction of the university, the administration stages Davos-like spectacles, of which the Schwarzman College celebrations are a prime example.

For all these reasons, we are calling on MIT's administration to cancel the February celebrations for the new college and issue an apology for inviting Henry Kissinger. If they are not canceled, we urge the MIT community to boycott these celebrations.

Since this won't be sufficient to address the deep structural flaws of our Institute and especially the Schwarzman College, we invite everyone to an alternate event at 5:30 p.m. on Feb. 26, organized by students and other members of the community, to discuss these systemic issues and the direction of the university. Finally, we ask faculty to support and enable participation in the alternate event Feb. 26 and in the urgent discussion it seeks to foster.

*Signatories include Alonso Espinosa Domínguez, Professor Ruth Perry, et al.*







NEWS IN REVIEW

2019 was a year of revelations, from the announcement of new undergraduate degrees to the discovery of thousands in donations from Jeffrey Epstein, the late financier accused of sex trafficking. Controversy surrounding sources of funding, including that of the new College of Computing, raised questions about donors and how their actions reflect on the Institute, leading to protests against MIT's relationships with not only Epstein, but also David Koch, Henry Kissinger, Stephen Schwarzman, and Saudi Arabia.

In addition, MIT's association with Epstein amplified concerns about the role of female-identifying members of the community and their treatment in places of learning and research, uniting students, faculty, and other MIT affiliates in protest and solidarity.

Cause for more student concern came with administrators'

announcement to close BC in June 2020 and the service-lapse riddled surprise implementation of Washlava laundry. After a long design process, Chancellor Cynthia Barnhart PhD '88 and Vice President and Dean for Student Life Suzy Nelson required that all dorms allow first years to squat and end mutual selection.

Not only will MIT continue to expand with the construction of new undergraduate and graduate dorms on Vassar Street, but also with its cultivation of interactions between departments, as embodied in the announcement of the new 6-9 major and interdisciplinary plans for the College of Computing. To accommodate changes brought by the college, the electrical engineering and computer science department restructured, dividing into three "faculties" to better facilitate collaboration between members of a growing popula-

tion. While administrators have touted the College as a holistic approach to advancing computing, some HASS faculty have felt that their role has been diminished and the societal implications of computing have been under-addressed.

As the community tries to seek a best response to these issues, *The Tech* will continue reporting on how administration, students, faculty, and other community members will — whether through collaboration or conflict — choose to address outside engagements, amend structural inequalities, and promote interdisciplinary dialogue. These issues have commanded both attention and action from broad segments of the MIT community — next volume, you might not only be reading our stories, but also be in them too.

—Whitney Zhang '21  
Volume 139 News Editor

2019

2/6/19  
**SAUDI TIES UNSEVERED**  
After an internal reassessment sparked by the killing of journalist Jamal Khashoggi, President L. Rafael Reif decided that there was no "compelling case" for MIT to withdraw from any of its existing relationships with Saudi private or government-funded sponsors and organizations.

2/18/19  
**CONSTRUCTION ACCIDENT**  
Three construction workers were sent to the hospital after a fall during the construction of the Vassar Street Residence. One died while the other two sustained non-life-threatening injuries.

2/13/19  
**BURTON CONNER RENEWAL**  
Administrators and house leaders announced that Burton Conner will be closed for about two years starting June 2020 to undergo renovations. Students must move out during construction.

2/21/19  
**DAN HUTTENLOCH**  
Dan Huttenloch, a founding dean of MIT's School of Engineering, was named dean of the College of Engineering.

8/26/19  
**CHANGING COMMENCEMENT**  
MIT administrators considered changing the structure of the 2020 Commencement ceremony, likely in the form of a short ceremony for all students followed by separate degree-awarding ceremonies.

8/23/19  
**COMPUTING AND SOCIETY CONCENTRATION INTRODUCED**  
The interdisciplinary HASS concentration requires students to choose four of 34 possible classes across nine departments. STS professor and concentration advisor William Deringer said in an interview with *The Tech* that students will explore the "historical and social drivers of new computing innovations."

8/20/19 and 8/21/19  
**MEDIA LAB ACADEMICS LEAVE**  
Ethan Zuckerman, director of the Center for Civic Media, and J. Nathan Matias PhD '17, a visiting scholar, left the Media Lab in light of revelations about Epstein's donations to the lab.

8/15/19  
**COCORON**  
COCORON, a group of students and faculty, announced a structural program to support students and faculty.

REX 2019 8/25–8/31/19  
**NEW ROOM ASSIGNMENT PROCEDURES**  
Following the ban on squatting and mutual selection, BC changed its room assignment process to an algorithm and a "values based selection process" with questions about the type of community students wanted to be in, BC President Alice Zhang '21 wrote in an email to *The Tech*.  
EC attempted using two algorithms sequentially to place first years first based on their preferences after visiting all the halls in the dorm, EC President Adriana Jacobsen '20 wrote in an email to *The Tech*. However, since the algorithms could not satisfy all student requests, EC reverted to its algorithm from the prior year.

8/23/19  
**REIF APOLOGIZES**  
Reif wrote an email to the MIT community, apologizing to Epstein's victims and promising to donate an amount equal to Epstein's gifts to charity benefiting victims of sexual abuse. Provost Martin Schmidt PhD '88 announced the formation of a working group examining institutional procedures on funding.

8/15/19  
**EPSTEIN DONATIONS**  
Jeffrey Epstein's donations of \$800,000, were unveiled. Reif apologized for not disclosing the donations.

8/26/19  
**GSL RESTRUCTURED**  
All Global Studies and Languages faculty were reassigned to other HASS departments as part of a restructuring of the GSL program. Administrative staff remained in their positions. GSL majors, minors, and concentrations were unchanged.

9/4/19  
**NEGROPONTE DEFENDS ITO**  
Nicholas Negroponte, who co-founded the Media Lab, defended Ito for his acceptance of Epstein's donations, saying that he encouraged Ito to accept them and would do it again.

9/10/19  
**ERIC LANDER**  
After being seen with Epstein in photos from a Harvard gathering in 2012, Eric Lander, president and founder of the Broad Institute, denied any other association with Epstein.

9/12/19  
**STANLEY**  
Vice President Stanley received a letter from MIT assuring students that the Institute is committed to a safe and supportive environment.

Approved Fall 2018, started Fall 2019  
**LIT MINOR FILM TRACK INTRODUCED**  
Film minors must take 4 literature subjects and 2 electives. Literature department head Shankar Raman '86 wrote in an email to *The Tech* that the new minor will emphasize "the interconnections between film analysis and literary study."

9/7/19  
**JOI ITO RESIGNS**  
Ito resigned from his position as Media Lab director after the *The New Yorker* reported that the Media Lab received at least \$7.5 million in Epstein-related donations. Ito also separately received \$1.2 million from Epstein for investment funds under his control.

9/12/19  
**REIF'S 'THANK YOU'**  
Reif reported the preliminary findings of the Goodwin Procter investigation in an email to the MIT community. He wrote that though he does not recall, he "apparently signed" a thank-you letter to Epstein for his donations.

2020

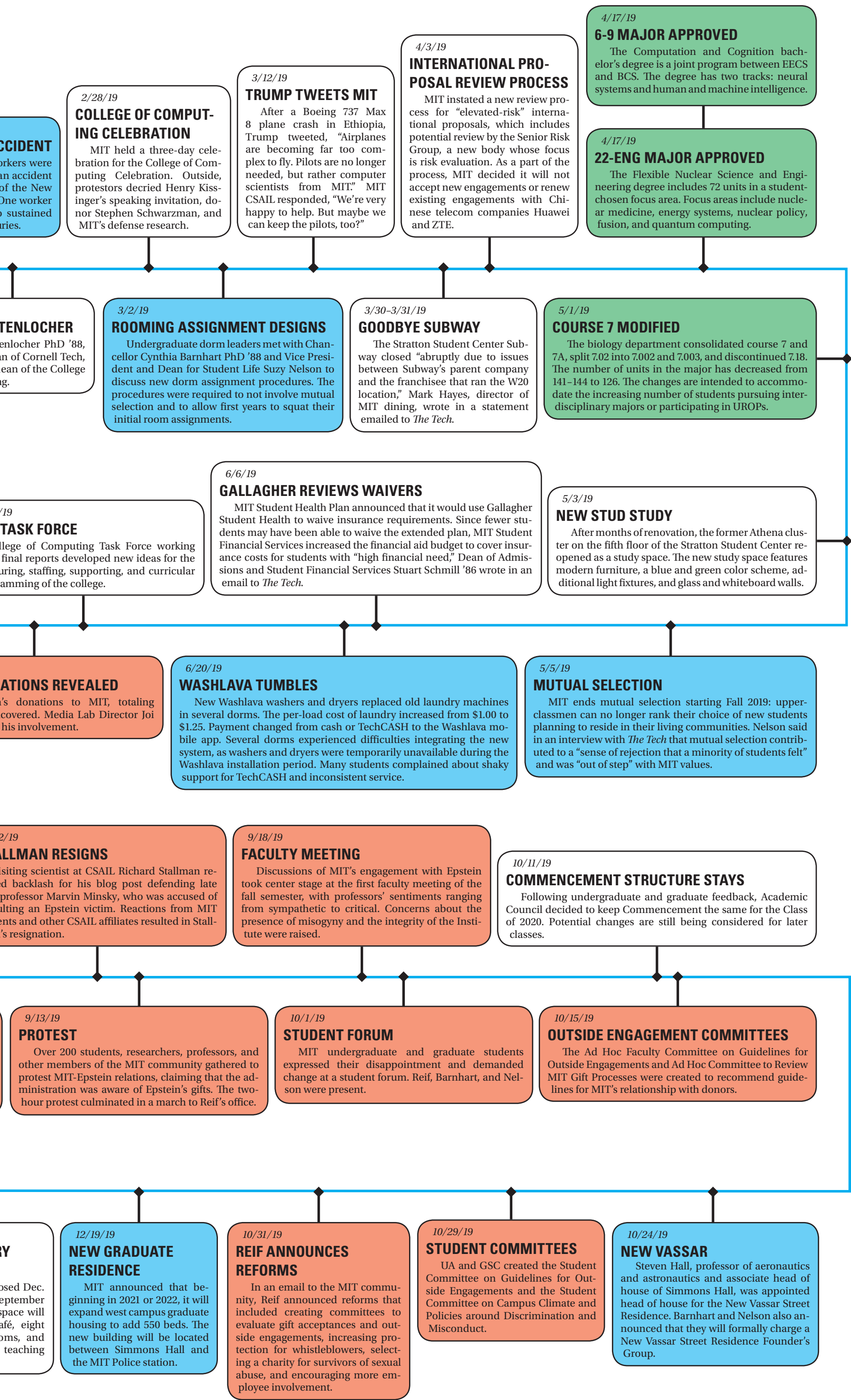
1/16/20  
**SETH LLOYD DENIAL**  
Lloyd wrote in a blog post that he did not conceal Epstein's identity and followed MIT policies for accepting donations. Goodwin Procter stood by its report findings.

1/10/20  
**GOODWIN PROCTER FINDINGS**  
Goodwin Procter reported that vice presidents R. Gregory Morgan, Jeffrey Newton, and Israel Ruiz approved Epstein's donations to MIT. The report stated that Reif was unaware of the donations. Epstein donated \$850,000 between 2002 and 2017, and he visited MIT nine times between 2013 and 2017. The report also stated that professor of mechanical engineering Seth Lloyd accepted \$225,000 in gifts from Epstein and "purposefully failed to inform MIT" that Epstein was the source of the 2012 donations. As a result, Lloyd is placed on paid administrative leave.

IAP 2020  
**BIOMAKERSPACE**  
A new biology makerspace, called the "BioMakerspace," opened over IAP. The lab has Biosafety Level 2 capabilities and contains basic equipment such as a tissue culture room, incubators, centrifuges, microscopes, pipettes, thermal cyclers, a refrigerator, a PCR, and common reagents.

12/19/19  
**HAYDEN LIBRARY CLOSING**  
Hayden Library closed for the last time in 2019 and will reopen in Spring 2020. The renovated space will include a new group study room, a flexible event and space.







scientific community when direct images of a black hole were released to the public after having been acquired with the help of MIT researchers. We also investigated the role that cannabis plays in the brain after a large donation was made to MIT and Harvard Medical School to support research at the intersection of neuroscience and cannabis.

the researchers who gave us a glimpse into their lives and their work, and for helping us share their efforts with the wider public.

— Jordan Harrod G  
Volume 139 Science Editor

# How mathematicians study wave equations

*Gigliola Staffilani has been studying wave equations representing physical phenomena since graduate school*

Waves are everywhere, from tsunamis to earthquakes to light. In fact, if you are reading this article aloud, you are producing waves. Even particles can be modeled by waves. Most waves are governed by a mathematical equation known as the wave equation. Gigliola Staffilani, professor of mathematics, has been studying wave equations representing physical phenomena since graduate school.

as a field and didn't have an end goal for myself becoming an expert in that field. I was lucky that it turned out to be a fundamental field in analysis."

Most of the time, Staffilani uses a mathematical tool called harmonic analysis to deduce the implicit properties of the solutions. Using harmonic analysis, she decomposes the wave functions into their con-

Staffilani acknowledged that a mathematical problem sometimes requires an interdisciplinary approach. "Best breakthroughs are done by people who bring ideas from different fields into the one they think they are expert on." In the past ten years, her research has been focused on using probability in solving nonlinear wave equations arising in physics. When Staffilani tried to answer about the existence and the uniqueness of a solution to the wave equation using the tools in the analysis only, she encountered some counterexamples. "Are

Recently, Staffilani has been trying to understand the origin of mathematical structures in solutions to the wave equation governing the Bose-Einstein Condensate. The solutions of Gross-Pitaevskii hierarchy that govern the Bose-Einstein Condensate have been found to be the product of solutions to the Schrödinger equation, which is a widely studied equation in quantum mechanics. Interestingly, the solutions are integrable. Integrability can partially be explained by “saying that there are infinitely many conservation laws like the law of conservation of energy,” but its origin is unclear from a mathematical standpoint. With her collaborators, Staffilani wonders what is in the Bose-Einstein Condensate and the Gross-Pitaevskii hierarchy that results in the integrability of solutions to the Schrödinger equation. “I am in the middle of finishing a 100 page paper describing exactly these types of questions.”

# Thinking about other people's thoughts

*The Saxe Lab studies the mechanisms of social cognition and their development in the human brain*

SCIENCE EDITOR

How morally permissible was it for Person A to put the powder into Person B's coffee? Should they be blamed for this failed attempt to harm?

One brain region in particular is responsible for this task of “thinking about other people’s thoughts,” as Heather Kosakowski, a graduate student in Saxe’s lab, explained. The right temporo-parietal junction (RTPJ), located above and behind the right ear,

This question served as the inspiration for much of the other work produced by the Saxe Lab and, in particular, for Kosakowski's efforts. "I think trying to understand what is going on at the beginning of human life in the brain — what can babies understand? What do they know? What don't they know? — are some of the most fascinating questions there are," she said.

Now, Kosakowski is working to replicate Saxe and Deen's study, expanding it to include data from up to 26 infants and in response to bodies and objects as stimuli. Her ultimate aim is "to figure out: what is the starting state of the infant brain? Can

we tease apart some of the developmental theories about the origin of knowledge and competing theories in cognitive development?"

The day-to-day logistics of such infant studies, however, are anything but straightforward. “Something people find surprising about baby research is how much work actually goes into getting a baby through the door,” Kosakowski explained. “There’s a lot of work that goes into recruiting and scheduling visits with babies.” The extensive data analysis that follows is compounded by other complications — babies’ movement in the fMRI scanner or falling asleep, for example. “Getting a baby in is a challenge, getting data from a baby is a challenge, and analyzing data is a challenge,” Kosakowski said.

Still, the Saxe Lab remains a trailblazer in the field of infant brain research because — unlike most fMRI studies, which analyze data from sleeping babies — Saxe has “really pioneered research with awake babies,” Kosakowski said. Her lab and others are starting to “ask interesting questions about what’s going on across the infant brain when infants are awake.”

Yet the Saxe Lab is notable for more than just its research. The culture and values of any lab are important factors that shape the direction of its work; according to Kosakowski, “[Saxe] is really unique as a scientist, as a mentor, and as a person,” she explained, “in that she works really hard to build a diverse lab group.” Many academic scientists follow a “very traditional trajectory” through their careers, ultimately re-

sulting in an increasingly homogenous culture with “brilliant people — but brilliant people who all really think very similarly,” said Kosakowski.

“[Saxe] recognizes that quality science requires a diverse type of thinking and does what she can to make that happen,” finding individuals for her lab who do not adhere to this typical academic trajectory, Kosakowski added. “She tries to push back at norms and question their validity in attempts to increase inclusiveness and also to increase the quality of her science.” Particularly in a field which examines the ways people think and the developmental reasons for that thinking, the decision to choose researchers with diverse sources and lines of thought is critical.

Down the road, the Saxe Lab plans to continue asking and seeking answers to the questions that have always motivated their research: how does the human brain construct thoughts? What is the starting state of the brain? How does experience shape brain responses? According to Kosakowski, studies on the neural basis of navigation, social reward learning, and language learning in infants — as well as Kosakowski's fMRI study on infants' visual preferences — are ongoing in the lab. Ultimately, "there's so much room there to explore more," she said.

As Saxe put it in her TED talk, “The whole project of understanding how brains do the uniquely human things — learn language and abstract concepts, and thinking about other people’s thoughts — that’s brand new. And we don’t know yet what the implications will be of understanding it.”



# This is your brain on cannabis

## MIT alumnus gives \$4.5M to support research into the effects of cannabis on the brain

**By Jordan Harrod**

SCIENCE EDITOR

The MIT School of Science announced on Tuesday that Charles Broderick '99 has made a \$9 million gift to MIT and Harvard Medical School to support basic science research into the effects of cannabis on the brain and human behavior through the creation of the Broderick Fund for Phytocannabinoid Research. With the legalization of marijuana becoming increasingly prevalent (11 states, including Massachusetts, have fully legalized marijuana, and 23 additional states have legalized medical marijuana), both the scientific and the medical communities have voiced concerns on the lack of research of the neurological phenomena that underlie the effects of marijuana use in adults and adolescents. Broderick, who has worked closely with marijuana companies since leaving MIT as a private investor and founder of Uji Capital LLC, created the fund in an effort to destigmatize cannabis use by increasing both the public and the medical community's understanding of the science behind cannabis.

MIT has received half of the \$9 million gift, and that \$4.5 million will be used to support four researchers at the McGovern and Picower Institutes: Earl Miller, Myriam Heiman, Ann Graybiel, and John Gabrieli. This gift aims to make strides in that area over the next three years by supporting both basic science and clinical research into the

neurological effects of cannabis. The Tech spoke with Miller, Heiman, and Gabrieli about their plans.

The Heiman Lab focuses on uncovering the molecular phenomena that lead to neurodevelopmental and neurodegenerative disease. Myriam Heiman, Latham Family associate professor of neuroscience at the Picower Institute, plans to use the funds to explore the relationship between cannabis and neurological disorders, specifically schizophrenia and Huntington's Disease. Her work in schizophrenia relates to the glutamate hypothesis, which suggests that dysfunctions in the glutamatergic signaling pathway contribute to the development of schizophrenia. Cannabis is thought to restore this pathway via the cannabinoid receptor, which reduces production of glutamate, a neurotransmitter that excites other neurons and is linked to many psychiatric disorders. However, long-term cannabis use in adolescents is linked to the development of schizophrenia for reasons that are not currently well understood. Heiman believes that developing a better understanding of the role of the cannabinoid receptor in this signaling pathway might uncover drug targets or therapeutic options that were not previously known, saying, "Often if you look at what is broken in a system, you can find out how the system works."

The Gabrieli Laboratory explores the neural circuit systems involved in emotion and learning through functional MRI (fMRI)

and behavioral studies. John Gabrieli, professor of brain and cognitive sciences and health sciences and technology at the McGovern Institute, is interested in focusing on the role of tetrahydrocannabinol (THC) in cognition. THC is one of the main psychoactive components of cannabis, giving users their characteristic “high.” “There’s some evidence that THC can promote cognition in patients with schizophrenia,” said Gabrieli. He plans to use the gifted funds to perform behavioral and fMRI studies on the effects of THC in adult patients with schizophrenia, in an effort to better understand the mechanisms that underlie this phenomenon. He is also interested in the potential use of cannabis to reduce anxiety in children with autism spectrum disorder, but plans to focus his initial work with the Broderick Fund on understanding the effects of cannabis on neural circuit dynamics in adults.

The Miller Lab studies the neural basis of cognition, focusing on how we focus our attention, hold ideas in our minds, and make decisions. Earl Miller, professor of neuroscience in the Picower Institute, explained his lab's work as striving to understand "network dynamics, how neurons work together in networks, and how these network properties produce cognition." The lab previously discovered that there are two types of brain waves involved in top-down and bottom-up processes — that is, processes where we act on our previous knowledge of the world and processes where we act on sensory informa-

tion. According to Miller, the balance of these two types of brain waves is important for normal cognition: "You can't have a brain where the floodgates are open and everything is coming right in. You have to have a brain where you can regulate what is important to pay attention to." Miller's interest in cannabis relates to these processes and the brain waves that seem to regulate them. "There's a lot of brain disorders, like attention deficit disorder, where this balance goes awry, so the first thing we want to know is the effect that cannabis has on the balance between top-down and bottom-up brain waves. No one has asked the question at that level yet." Specifically, he is interested in understanding how cannabinoid receptors, which are involved in appetite, pain, mood, and memory via the aforementioned excitatory glutamate pathway affect neural circuit dynamics that influence these brain waves.

Looking towards the future, all of the researchers hope to uncover some of the basic mechanisms, on a molecular or systems level, that drive our experiences with cannabis. This knowledge has the potential to both help scientists better understand cognitive functions at the molecular and neural circuit levels and help clinicians design better treatments for neurological diseases. In speaking to MIT News on the topic, Broderick outlined similar hopes for his gift, stating that “We need to replace rhetoric with research” in national conversations around cannabis legislation and use.

# What happens to science when the government closes?

# The longest government shutdown in U.S. history ended last Friday

**By Jordan Harrod**

*SCEINCE EDITOR*

After five weeks of confusion and protest, President Trump relented on his demands for border wall funding when airports across the Northeastern seaboard were forced to temporarily ground their flights due to lack of FAA and TSA employee attendance. The shutdown forced several research agencies to halt their work, including NASA, the FDA, the NSF, the USDA, NOAA, and NIST. It also disrupted the work of research agencies not directly impacted by the shutdown, including the NIH and the DOE, as much of their work necessitated access to agencies that were closed.

It should come as no surprise that MIT researchers did not make it out unscathed. Sixty-six percent of funding for research on MIT's campus is provided by the federal agencies, with much of that funding coming from the NSF and NOAA. Proposals for new or renewing federal funding were not processed during the shutdown, leaving researchers in limbo and potentially without adequate funds to support current projects. Students directly funded by these agen-

cies were ill hot water both in the lab and at home, as some did not receive paychecks during this time. And although the government has now reopened, the shutdown has and will continue to have a lasting impact on their work.

MIT researchers wrote to *The Tech* to recount how they were impacted by losses of funding, cancelled conference sessions, missed opportunities for collaborations, and more:

“Our lab, the MIT Civic Data Design Lab (led by Sarah Williams) contributed to an exhibit on the future of transportation at the Cooper Hewitt Design Museum in NYC, on display through March 31. Because the museum is operated by the Smithsonian Institution, a federal entity, it has been closed since Jan. 2. This means that for four weeks, our exhibit has been closed to the public, and we have been unaware whether viewers would have the opportunity to see it again before the end of its run.”

*Griffin Kantz, master's candidate in city planning in the Department of Urban Studies and Planning*

"For my thesis, I am researching the barriers to socioeconomically diverse visitation at National Park Service Units. As my thesis proposal explains, I obtained MIT funding to support my research to travel out to Los Angeles for case study research. I planned to meet with NPS staff in LA, but was unable to do so due to the shutdown.

I was also planning to visit NPS staff in DC to research ways to integrate my findings into park planning practices. Due to the shutdown, this visit was canceled. My thesis was majorly impacted by the shutdown.”

*Tessa Buono, master's candidate in city planning in the Department of Urban Studies and Planning*

“The shutdown has prevented me from seeing the reviews of my most recent proposal, and that in turn has prevented me from discussing the situation with my program manager (who can’t talk to me anyway during the shutdown). There is a Feb. 15 proposal deadline (which may be extended, but who knows?), which would be

my last chance to get a proposal in before all of my research funding vanishes this summer."

*Edward Boyle, professor of ocean geochemistry in the Department of Earth, Atmospheric, and Planetary Sciences*

"I'm a post-doc fellow at the Whitehead Institute, and I'm supported by an NSF grant. Given the way my fellowship is administered, I haven't been able to access my fellowship funds (which pay my stipend) since the shutdown started. My research per se hasn't been greatly affected, as the Whitehead has been very supportive and helped me to set up a way for me to access my funds for research before the shutdown started.

However, I recently returned from the Plant and Animal Genome conference, and there were plenty of signs of the shutdown evident there: canceled sessions and talks, and people not being able to even talk about their research in one-on-one conversations."

*Becky Povilus, postdoctoral fellow in the Gehring Lab, Whitehead Institute*

# Direct images of black hole taken for the first time

## Results show no deviation from theory of general relativity

**By Billy Woltz**

On Wednesday, the Astrophysical Journal Letters published a special issue featuring four images that have a lot in common: they show a dark splotch surrounded asymmetrically by a bright orange ring, all against a black background. These are the first images of a black hole ever taken. Specifically, the pictures show a supermassive black hole in the center of Messier 87 (M87), a galaxy in the Virgo cluster. M87 is about 55 million light years away from Earth.

The images were the result of a years-long effort led by astronomer Shep Doeleman at the Harvard-Smithsonian Center for Astrophysics. The project involved an international team of over 200 astronomers, including members of the MIT community.

working at the MIT Haystack Observatory  
in Westford, Massachusetts.

Black holes are astronomical objects that form when the density of mass in a given place is high enough to exhibit a gravitational field so strong that nothing, not even light, can escape beyond a certain distance. This distance is known as the “event horizon.”

Because nothing escapes from a black hole, it was doubted that astronomers would ever be able to observe black holes except by indirect methods. The pictures published on Wednesday directly contradict this expectation.

To make this direct measurement, astronomers took advantage of the extreme gravity that the black hole exhibits. This gravity causes a dense gas to form outside the event horizon as matter falls in, similar to water going down a drain. The density

of the gas and resulting pressure make the matter extremely hot, causing it to spew out radiation.

Using a network of eight telescopes scattered across the globe, collectively known as the Event Horizon Telescope, the researchers were able to detect this radiation and use it to form the images. This was no small feat, as viewing the black hole with the resolution in these photos required about the equivalent magnification as would be needed to read a newspaper in Tokyo from San Francisco. To magnify something by this amount, one would need a radio receiver the size of the Earth itself. The collaboration got around this requirement by synchronizing the eight telescopes so that they effectively act as one big telescope.

These images show no deviation from theoretical predictions, providing another

piece of evidence to support the theory of general relativity, first developed by Albert Einstein in 1916. In the theory of general relativity, gravity is a result of the curvature and interdependence of space and time, collectively known as "spacetime." The curvature is caused by interactions involving mass and energy. Objects can freely travel through this bent spacetime on locally straight lines, which may appear curved to an observer if one does not otherwise account for the curvature of spacetime.

The images demonstrate a proof-of-principle that one can directly image black holes by observing light. What's next? According to their publications, the researchers are interested in improving the resolution of the images and studying them to develop a deeper understanding of black holes.



—Ivy Li '20  
Volume 139 Arts Editor

Very soon, you feel that you *know* these townspeople. Not only do you know their quirks and their habits, but you feel that they are characters that you've met in your own life. You know how many children Ann Putnam has buried, how many times Giles Corey has taken someone to court, and how often John Proctor goes to church. The characters Miller creates (some historical, some fictional) aren't mouthpieces for his opinions or cardboard cutouts — they're complex, realistic, flawed, idealistic. But this multifaceted nature of the characters wouldn't come through if it weren't buttressed by the nuanced interpretations and forceful performances of the Bedlam actors.



# Our Favorite **Films** of 2019

## ***Avengers: Endgame*** **(Joe and Anthony Russo)**

Would it really be a “Best of 2019” list if the highest-grossing film of all time weren’t included? It may not have some of the more traditional cinematic qualities found in its fellow films on this list — in fact, it may not even be true “cinema” — but the sheer cultural impact alone is enough to land *Avengers: Endgame* a place in our top 10. Culminating a decade of consecutively successful superhero movies, *Endgame*’s expectations were high and anticipation surrounding the bookend to the most successful franchise of all time was palpable, to say the least. Luckily for everyone involved, the Russo brothers managed to concoct a satisfying conclusion to the generational saga. *Endgame* brought together ten years worth of film characters and storylines, creating new relationships and concluding old ones, establishing newer characters and saying goodbye to old ones. It managed to simultaneously pass on the torch to the next generation and wrap up a decade’s worth of stories. Robert Downey Jr.’s “I am Iron Man” will most likely go down in history as one of the most iconic movie moments of all time. *Endgame* not only met its already high expectations, but exceeded them.

—Erika Yang



COURTESY OF WALT DISNEY STUDIOS

**The Avengers assemble once more** in the MCU film, *Avengers: Endgame*.

## *Us* (Jordan Peele)

In 2019, several of the most exciting young filmmakers working in the horror genre released their second features, including Robert Eggers' *The Lighthouse* and Ari Aster's *Midsommar*. But the most impressive sophomore outing ultimately belonged to Jordan Peele, whose follow-up to the wildly successful, Oscar-winning *Get Out* came in the form of a dark and violent contemplation on the dangers of historical amnesia. Much like *Parasite*, *Us* cleverly blends and transcends genre, masking its scathing social commentary under a thick veil of comedy and suspense. And just like Bong Joon-ho, Jordan Peele uses the motif of underground passageways to argue that those who think unpleasant truths and traumatic secrets can simply be buried away, hidden out of sight, are long overdue for a violent reckoning. The result is a richly layered narrative that has something meaningful to say about race, class, gender, and so much more. There may not be a better pair of films that captures the horrors of living in our contemporary capitalist society.

—*Shreyan Jain*

## *The Irishman* (Martin Scorsese)

Through masterpieces ranging from *Goodfellas* and *Mean Streets* to the Oscar-winning *The Departed*, Martin Scorsese has spent the past fifty years repeatedly reinventing the American mafia story. With *The Irishman*, Scorsese gives us a fitting yet bittersweet coda not only for his own extensive filmmaking career, but for the mobster genre itself. *The Irishman* methodically dissects the very tropes and motifs that Scorsese helped popularize, stripping the life of a career gangster of its usual cinematic glamor until all that is left is the slow moral decay, the crumbling relationships, and the ever-increasing stakes that ultimately pit brother against brother. The film may run three-and-a-half hours long, but it's not until the final thirty minutes – when we see anti-hero Frank Sheeran pass the twilight of his life in the quiet loneliness of a prison cell and a nursing home – that the film feels uncomfortably, almost painfully drawn out. As Sheeran meditates on his sins and wrestles with his guilt, we realize Scorsese, now approaching the twilight of a decades-long career spent immortalizing violence on the big screen, is doing the same. Rarely has a film given us such an honest and brutal look inside the consciousness of a man struggling to come to terms with his life's work.



WILSON WEBB

**Laura Dern and Scarlett Johansson star** as Nora Fanshaw and Nicole Barber, respectively, in *Marriage Story*.

## ***Knives Out*** **(Rian Johnson)**

The premise of *Knives Out* is simple: After the apparent suicide of a wealthy family patriarch, a famous detective arrives to investigate the dead man's relatives. The following two hours are filled with intrigue, humor, twists, and turns. This delightful mystery stands out through its excellent attention to detail. Despite the ensemble cast, each character is distinct and well defined, making their familial drama remarkably entertaining, and while the plot is sufficiently convoluted to match blow-for-blow with the greatest detective stories, it manages to remain entirely sensical (no small feat — I'm looking at you, *Murder on the Orient Express*). If you're looking for a good time, *Knives Out* is an excellent place to start.

—Lior Hirschfeld



COURTESY OF CLAIRE FOLGER

**Ana de Armas stars** as Marta in *Knives Out*.

## *Once Upon a Time in Hollywood* (Quentin Tarantino)

Tarantino is not a stranger to the concept of alternate realities and playing with time. He walks us backwards through the chronological events of *Pulp Fiction*. He gives us a satisfying end to the second World War through *Inglourious Basterds*. In *Once Upon a Time in Hollywood*, Tarantino takes us back to the fearful reign of Charles Manson, but once again asks, "what if the right person was in the right place at the right time?" Thanks to Leonardo DiCaprio and Brad Pitt, we get an entertaining and psychotic banter for the entirety of the film, right up until the explosive and expectedly blood-and-guts ending. The other characters supplement the historical caricature that is so characteristic of Tarantino's directing style, which never falls short of entertaining and impressing his viewers.

—Nathan Liang

## *The Farewell* (Lulu Wang)

In 2018, Crazy Rich Asians obviously made a breakthrough for Asian representation in Hollywood. Though I thoroughly enjoyed it, there was still something missing there that *The Farewell* encompassed a year later. After the trailer for *The Farewell* came out, I remember texting my friends, freaking out because this was my people and my story represented on the big screen. I have never gone on a lavish trip to Singapore to see my boyfriend's family (and likely never will). To be fair, I have also never traveled to China for a wedding — set up only to visit my dying grandmother. But I do know about lying to protect a family member and all the other details of the Chinese-American experience that director Lulu Wang captures in this elegant and nuanced film. There's certainly a long way to go for representation in Hollywood; after all, this is only one movie, and the Academy unfairly snubbed it. Nonetheless, *The Farewell's* popular and critical reception (along with Awkwafina's Golden Globe) still offers some hope for fresh, diverse storytelling in an industry increasingly dominated by ballooning budgets and redundant remakes.

—Liane Xu

## *Jojo Rabbit* (Taika Waititi)

Besides *Avengers: Endgame*, *Jojo Rabbit* was my most-anticipated movie coming into 2019. A film about a little boy whose imaginary friend is a goofy version of Adolf Hitler really shouldn't work in today's world...and yet it somehow does – due in large part to Taika Waititi's unique direction. Coming off of his momentum from revitalizing the Thor franchise, Waititi cemented his name into the households of the general audience. He has this unique combination of heart and wit that makes his films both incredibly heartfelt and humorous, as evidenced by *Jojo Rabbit*. Despite being a period piece, the film carries more weight as a commentary on modern society, as prejudices that existed in the 1940s are, unfortunately, still very much prevalent in the current day. Armed with an excellent cast and a brilliant script, Waititi moves the film in a manner that is respectful enough to not offend too many people, satirical enough to drive the theme across, and heartwarming enough to lend some hope into the world.

—Erika Yang

## ***Marriage Story* (Noah Baumbach)**

Hands down my favorite film of the year. What sets *Marriage Story* apart from its fellow films on this list (and my favorite part about it) is its complex simplicity. The composition of the film is simple in nature – it can be boiled down to actors simply acting in front of the camera. There are no gimmicks, no complex or background plots, no special effects, etc – the film more or less relied on the cast themselves. Yet there is nothing simple about the acting. All the actors have to work with are each other and the script, and that is where the complexity is derived. Baumbach required the cast to strictly follow the script, leaving little to no room for improvisation, constantly pushing for more takes of the same scenes to get it right. The performances from the entire cast were nothing short of spectacular, but the two leads (Adam Driver and Scarlett Johansson) delivered especially laudable performances. The script itself is a gem, but the pure emotion and rawness from each of them is what truly elevates the film. Driver and Johansson give what can only be called a masterclass in acting. *Marriage Story* is a beautiful film about a love story...about a divorce. It is heartbreaking, yes, but definitely well worth at least one (or five) watches.

—Erika Yang

## *Toy Story 4* (Josh Cooley)

Since *Toy Story*'s beginnings in 1995, the charismatic cowboy and space cadet duo has charmed children and adults alike. While *Toy Story 3* may have seemed like a less notable addition to the franchise, *Toy Story 4* brings a heart-wrenching dose of nostalgia as well as a mature story to cleanly wrap up Woody's saga. The soundtrack is filled with *Toy Story* classics and people who grew up with Woody and Buzz's adventures will lovingly enjoy this supposed last installment to the series. The story tackles ideas of abandonment, loss, and accepting change, relaying these themes in a way that children can understand and parents can appreciate.

—Nathan Liang



—Shreyan Jain





COURTESY OF WARNER BROTHERS STUDIOS

**Christopher Nolan weaves** his dream world.

## *Parasite* (Bong Joon-Ho)

We simply couldn't omit the best film of the year from this list. In our previous list, we highlighted *Parasite*'s brilliant screenplay, which allows the film to morph from genre to genre as it violently attacks the social structures that bind the Kims and Parks within their parasitic relationship. What really elevates the film to a masterpiece, however, is how well the camerawork and production design complement the script, spatializing and visualizing the oppressive hierarchies that are the object of the film's scathing critique. Bong Joon-ho blocks and shoots scenes with the Kim family so that they positively fill the frame, emphasizing the cramped, squalid conditions of the destitute family's tiny Seoul basement while also suggesting that, despite their daily struggles, the Kims always maintain a feeling of unshakeable solidarity. Even as they move into the Park family's gigantic Edenic estate, the Kims stick together, going out of their way to bring each and every one of their tight unit into the household. The scene where they take advantage of the Parks' vacation to sit and feast together on a single sofa shows the warmth and togetherness that is sorely missing from the lives of their rich employers. If *Parasite* succeeds in its portrayal of the evils of capitalism, it is at least in part because Bong Joon-ho never fails to humanize the face of poverty even as he shows the sheer depths that people can fall into.

—Shreyan Jain



COURTESY OF COLUMBIA PICTURES

**Andrew Garfield, Joseph Mazzello, Jesse Eisenberg and Patrick Maple** gaze into the future of everyone's social lives.

***Spiderman: Into the Spideverse***  
(Peter Ramsey, Bob Persichetti,  
Rodney Rothman)

In 2018, *Spiderverse* released to a daunting challenge: as the seventh Spider-man film, it needed to do more than just entertain. It had to present a novel iteration of a character viewers were already intimately familiar with, avoid rehashing existing storylines, and justify its own existence as an independent film operating in the shadow of the MCU. *Spiderverse* does it all, and it does it all so well. As we follow Miles Morales (Shameik Moore), our young protagonist, we're taken on a journey of loss, friendship, and self-discovery that perfectly weaves humor and sincerity. Not to be outdone in ambition by concurrent franchises, *Spiderverse* bombards viewers with alternative realities, a large collection of heroes and villains, and countless comic book easter eggs, all in a single runtime. The entire film is made that much stronger by its unique animation style, which brings the comic book format to screen in a completely novel way. By turning apparent weaknesses into re-sounding strengths, *Spiderverse* tells a compelling story that stands out in the crowded superhero genre.

—Lior Hirschfeld

## Spotlight (Tom McCarthy)

*Spotlight* is one of the few times that Hollywood has done a true story justice. It's not messed around and glorified to appease audiences, which is fortunate because this story is extraordinarily important. Named after the Boston Globe's investigative journalist team, the film follows team members Michael Rezendes (Mark Ruffalo) and Sacha Pfeiffer (Rachel McAdams) as they dig up information on child molestation by Catholic priests and bring it to the public. Despite winning the Academy Award for Best Picture, there are few deep emotional outbursts that characterize a lot of Oscar-bait films. It's the subtle, detailed, and truthful acting, especially from McAdams, that shines through here. Even McAdams' smallest gestures perfectly embody both Pfeiffer's dedication to her job and her pain from knowing the truth. More importantly, although *Spotlight* is already a great film because of its outstanding acting and directing, it's a uniquely special film because it is still relevant. It emphasizes the indispensable role of investigative reporting, and it illustrates the hurdles that people in power create to prevent others from holding them accountable. Since its release in 2015, we've witnessed the #MeToo movement and other events remind us that *Spotlight's* themes on journalism and abuse continue to be important.

—*Liane Xu*

## ***The Social Network*** **(David Fincher)**

History remembers the late 2010s as the post-truth years of social media, but before that, *The Social Network* graced the world with its own critique of Facebook. Its age is showing as the ironies of the tech world have become so commonplace, but for a film that came out ten years ago, it was remarkably prescient. By daring to make Zuckerberg (unsurprisingly) unlikeable and Facebook's case (surprisingly) exciting, Aaron Sorkin's writing swivels the film back and forth between the court case and the founding of the company. With Fincher's direction, a sexist, toxic, elitist startup culture superimposes itself onto college antics and the courtroom. Dialogue is paramount to this film working as well as it does; the Winkelvoss twins suing Zuckerberg should be boring, but the fast beats of this film make for a thrilling ride even today, when the themes of ego, money, and power remain the same.

—Ivy Li



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**Spiderpeople from different alternate universes** collide in *Spider-Man: Into the Spider-Verse*.



