Thursday, February 06, 2020



# 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



# **CAMPUS LIFE IN REVIEW**

Our Campus Life section is, at its best, a happy home for slice-of-life stories by and about MIT students that may otherwise go untold and unread. Pieces have provided advice by Auntie Matter and her successor, Tech Support; featured items from the "101 things to do before you graduate" list circulated to first years; and called for providing free menstrual products in campus bathrooms.

But the section is also, at its lowest, a

ghost town. We've been without an official editor for the past two volumes, and articles are often few and far between. So, here's a request: if there's a microcosm of life on campus that you would like us to cover — or

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 世 freaking out

Why having free tampons and pads in campus bathrooms is necessary

**By Yingni Wang** 

It was freshman fall, and I was sitting in my 7.012 lecture. Professor Eric Lander was up front, in his iconic blue shirt. Everyone was ready to get their minds blown away. Unlike my classmates, I could not focus on the lecture. I was instead intensely focused on an urgent optimization problem:

If I wait until the end of the lecture, will it bleed through my maroon pants? On second thought, these pants are quite dark, close to a taupe color, so even if it does bleed through, maybe it wouldn't be obvious? Oh my god, these seats are light grey, so if it bleeds through my pants, it will definitely stain the seat!

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!"

It was not bad advice. I distinctly remember giving similar advice to my best friend when she was visiting Beijing, my hometown. As a local, I dutifully suggested that she bring pocket pack Kleenexes with her all the time because there might not be toilet paper. But she always forgot. Once, we were in bathroom stalls right next to each other. As my friend put her hand under the gap of the stall wall, reaching for my Kleenex, I lightheartedly complained, "Stop using all my Kleenexes! Bring your

"I'm not used to bathrooms without toilet paper! It doesn't make sense."

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

percent of MIT, am used to using campus bathrooms without menstrual products. I am used to folding toilet paper in a dozen layers to make a substitute pad so I don't have to miss lecture. I am used to worrying about bleeding through those layers of toilet paper instead of actually listening to my lecturers. I am used to being so worried about bleeding through my make-do pads that I leave lectures to avoid embarrassing myself. I am used to blaming myself for forgetting to bring tampons or not bringing enough. I am used to this "little inconvenience."

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

The lights were dim, and the cranes cast weird shadows on the gritty concrete floor. Each step I took echoed a little. We moved slowly, past doors with bolded warning signs and metal double-doors. Behind us, the lights shut off one by one. When we left the "warehouse," our feet hit creaky wooden boards, and I took my first breath of fresh air in hours. Leaves rustled to the left, and crickets chirped in the distance. We were free.

It all began about 12 hours ago. I had just sat down at my desk and tried to ssh into the lab's login computer as I did every morning. While I waited for the login to go through, I pulled up my to-do list for the day. My supervisor was incredibly organized, and he guided my tasks through a shared document where he listed out what simulations I should run and what specifications they should have. Despite all that hand-holding, I didn't feel underqualified or out of place. When I clicked back to the terminal, it took me a moment to realize that the login had failed.

The Course 3 lab I worked in during my freshman summer at MIT ran molecular dynamics simulations, so they had a large cluster of computers for this purpose. It wasn't perfect, so it was no surprise if a few

of the simulation nodes went down during the day, but I had never seen the login node (which lets users access all of the nodes) go offline.

It was moving day for the machines. Almost every day over that summer, my supervisor spent a few hours tending to the group's computers, preparing to upgrade the cluster and get them a nicer home. I remember asking why he spent so much time on this; the old cluster was usable, after all. He responded that the group needed the resources, and despite having no interest in continuing with biological simulations (he now works at Amazon), he'd see it through.

And finally, the computers were getting transported from a dingy little room in the basement of the Infinite to the Bates Research and Engineering Center, a facility which once housed a linear accelerator that is now used for some miscellaneous MIT research tasks, including cluster-hosting.

My supervisor roped two other undergrads and me into helping with the move. A bumpy car ride later, we had gone from the friendly offices of 400 Technology Square to an obnoxiously loud, immaculately white room that looked like it was straight out

of a sci-fi movie. There were slanted rows of giant black lockers, each with a knot of wires emerging from the top. We shoved in squishy yellow earplugs that barely blocked out the buzzing. It was like standing in a room with thousands of refrigerators, all humming away.

The other two undergrads and I were tasked with securing sliding rails in the designated lockers, sliding the computers into the appropriate shelves, and wiring them up. It took a few tries before I totally got the rhythm of it, including where to place my head relative to the fan so that my hair wouldn't get sucked in. I'm not sure how many computers I placed and wired that day, but I know it was enough to last me a lifetime.

I marvelled at how my supervisor never seemed to tire and instead bulldozed through and even set up the software for managing all of the computers. At the time, I thought perhaps this was his duty as a graduate student, but when I think about it now, this project must have been a product of his own drive.

When we finally packed up to go back to MIT, it was already nearing 10 p.m. We padded slowly down the the concrete steps and into a warehouse-like area.

Stepping out of the facility, I had a moment of realization: I had just spent hours laboring over something that I'd never use or benefit from, and this was merely a fraction of the months that my supervisor dedicated. To me, it was a fun field trip, but I wonder what meaning it held for him. Did he gain anything from it, or was it just a step in the journey? As we piled into the car, we laughed.

I attended my supervisor's PhD defense last fall, and though I didn't understand the bulk of it, I could pick out some familiar phrases and key terms. Most of the work I did didn't make it into his thesis and was never published either, but the impact of that summer stays with me.

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.

—Josephine Yu

#### Drive through Boston/Cambridge

"I don't know when to turn," I said, vaguely panicked. My partner responded with something reassuring. He was buckled into the passenger seat beside me, and I envied his comfort. Through the windows, I could see cars all around us, zipping by in front or at rest across the street, waiting to rush forward.

I was stopped at that tricky Mass. Ave. and Memorial Drive intersection. Usually, I'm a pedestrian on the sidewalk nearby, impatiently waiting to cross the road on foot. On that day, though, I was trapped in a rented metal-box-of-death which the rest of you might call a car. We were headed to a concert in Portland, Maine because it was the summer before my senior year, and in summer, I'm allowed to drive away from TFP and pretend I'll never be sleep-deprived again, pretend I'll never have to crank out another paper or pset at 3 a.m. as my vision goes blurry. That trip was my first time driving in Cambridge.

Yet, I didn't want my foot on the gas pedal. I didn't want the wheel in my hands.

In many ways, driving is all about trust. Everyone on the road operates their own box-of-death, and the only way we can all feel safe as we hurtle forth together is to believe that we're all on the same page. We'll all follow the rules and maneuver our death-boxes carefully. I'm great at this, great at trusting others on the road, but I don't trust myself. That's my issue — driving requires confidence in your decisions and in the way you execute those choices.

I'm the driver who can't decide what to do at a yellow light, slows down without stopping, realizes the light will turn red before she can reach the other side, alternates between braking and inching forward, and ultimately faces the wrathful beeping of oncoming traffic. I'm the driver who waits for a road to empty completely before turning onto it, to avoid any miscalculations. As that driver, I can work with wide, low-traffic roads back home, but I am not compatible with Boston's streets.

At that Mass. Ave. intersection, as I waited for a green light, I wondered how I would manage the rest of the drive. I watched pedestrians pass in front of my rented deathbox and wished we could trade places. I imagined myself crossing the street with them, as I had done so many times before, with the river glittering on one side, car bumpers gleaming on the other. And as I imagined this walk, I had a sudden realization: my view from inside the car was different from my view as a pedestrian.

You might think this epiphany obvious, inane, not worth noting, but please bear with me. If, like me, walking is your main way of getting around campus, you've seen every building, every shrub, from your position on the sidewalk. In my rented death-box, I saw campus from the middle of the street, through a windshield. This may not seem so different — the buildings, the shrubs remain the same — but driving, not walking, down Mass. Ave. for the first time was like wearing an old sweater that had shrunk a little in the

wash. The experience of wearing it is essentially the same, but everything is somehow

I had never seen a view of the river from inside a car, facing Harvard Bridge. I realized it was the perspective of an outsider, of someone passing through. I saw that one day, I will be that someone, just passing through — I will graduate, and I'll stop traversing these sidewalks which have grown so comfortable. Instead, I might drive down Mass. Ave. to the real-person job which awaits me, to a new home, a new life, devoid of psets and college friends, and I might see this campus most frequently through the view in my windshield.

That view told me: you won't be in college forever. When you hit the road with your degree, the wheel will be in your hands and no one else's.

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

# **Auntie says farewell**

#### Auntie Matter on how she gives advice

Big news: Auntie Matter is graduating! At commencement, you might notice two students stacked on top of each other inside regalia. That's Auntie.

She invites would-be advice-givers to hang up their own shingle next year and start giving advice to the lovelorn, the academically agonized, and the employment embittered. (Uncle Energy? Auntie Symmetry? Grandma Gravity? Cooking instruction from Cousin Cuisine?)

To ready the path for the next generation of advice givers, Auntie will offer some reflections on the principles by which she has written this column. Like any teacher at MIT, she will demonstrate these principles for you by solving an example problem and then leaving you on your own for the rest of

Dear Auntie Matter,

My friend keeps unloading her problems on me and asking me for advice on almost everything she does. It's getting kind of exhausting. I don't want to hurt her feelings, but I dread talking to her because it's depressing. She's also been invasive with the questions she asks me lately (which I suppose is fair given how much she's told me, but I'm not comfortable with it). She also talks about how she's a romantic and is "meant to be with someone," but it doesn't seem healthy, especially given how much she worries about her crush. I know I need to talk to her about this, but I'm not sure how to bring it up in a way that would be

- Frustrated Friend

Dear Frustrated,

Auntie will address both you and her reading audience in this column. She appreciates your willingness to be an example!

Auntie's first step in reading any letter is to look at what can be inferred. Usually, the root problem in a letter is not the explicit subject of the letter. In this case, Frustrated asks about how to speak to her friend (about their relationship and about her friend's romantic life). Frustrated does not need advice about what words to use with her friend but, instead, about what has gone wrong in her friendship and why.

The biggest implicit clue in this letter comes at the end. The subject of the letter is a friend who needs too much advice, but tellingly, Frustrated closes with a question about how to give the friend yet more advice!

Frustrated, you resent on some level the neediness of your friend (despite your best efforts to prevaricate on the matter "I suppose [it's] fair," "I don't want to hurt her feelings," etc.), but you cannot resist interceding nonetheless. You want your friend to need you, and your friend is needy. It is easy to see how this dynamic perpetuates itself.

There are a few other clues that Auntie gained from this letter that can shed more light on the situation. Frustrated's friend does not seem to notice that Frustrated is uncomfortable with her personal inquiries and her dependency.

Frustrated, perhaps your friend lacks social skills generally and has not noticed that you are growing resentful. Or perhaps she has noticed, and this makes her cling tighter. Auntie also noted that it seems like Frustrated wanted permission to cease being friends with this person — if that is the case, Frustrated, you have Auntie's permission.

The last sort of 'meta-analysis' that Auntie usually does of a letter is to look at how a letter-writer thinks — what sort of thought patterns they have, and how it might lead to the sort of trouble in the letter. In this case, the issue seems to be with a toxic friendship, not toxic thought patterns, though Frustrated would do well to think about why she feels so obligated to help her friend.

In light of her observations on the letter, Auntie offers practical advice. She reflects on what would be good for the letter-writer based on her analysis, and comes up with steps to achieve those goals.

In this case, Auntie thought the friendship was unhealthy, and she wasn't confident in the communication skills of the people involved. Therefore, she is offering advice on how the letter-writer can get distance from the friend without having to have a conversation about it. She thinks that these two individuals are not well-suited to be close friends, so she is not telling Frustrated to maintain an intimate

Especially if a more distant friendship is the goal, a slow drift, rather than a conversation, is the best way to get there. If you will be more distant, there is no need for such intimate communication. Auntie is also offering advice on what to do in the moment when the friend is relating her problems or asking personal questions.

First, Frustrated, you can try to shift the dynamic. Auntie recommends doing so in

an unspoken way - she is not sure a conversation about your friendship would be productive, as your friend seems too fragile to withstand candid feedback and would likely take such a conversation as a complete rejection. Try to only hang out with your friend in group settings, or when you can do more structured and engrossing activities, such as watching a movie, playing games, doing an escape room, etc. We are also coming up on the summer, which could be a natural time to get some distance from your friend.

However, you may sometimes still end up in an emotional conversation with the friend. If this happens, try to have an excuse or an activity afterwards so that you can more easily leave the conversation. And if she is pressing you to share personal things, you should express that you're not comfortable sharing.

Auntie also imagines that a number of interactions between you and the friend occur over online messaging. If the friend is messaging you about her personal problems, wait a few hours before messaging her back and don't message her back at length. Instead, simply say, "I'm sorry to hear that's bothering you," and try to shift the conversation, e.g. by sending a funny video or meme.

If you cannot reset this friendship, or if you just don't enjoy spending time with your friend, Auntie thinks the friendship should be tapered off. Gradually spend less time with her. Try not to be available for one-on-one time. Luckily, you are no doubt genuinely quite busy, so this should not be too hard.

#### **ADVICE**

# **Tech Support**

#### Supporting the MIT community, one query at a time

Tech Support: Hello, how may I help you? Reader: I'm bored at my UROP but don't want to waste my summer. How can I make the most out of it?

Tech Support: You can learn a lot from an experience even if it's not the most ideal. What is at least one positive or something you enjoy about your UROP? Are you gaining any new skills or experiences that can help you for the future? Ask your supervisor or other people at your lab if they have projects you can help out with and talk to them about what made them do what they're do-

I would also recommend thinking about what exactly you find boring at your UROP maybe it is the subject matter, the environment (i.e., amount of human interaction, coworkers), or perhaps even the act of sitting at a desk for eight hours a day (and whether it is desks in general or this particular desk). Try tracking your energy for some period of time (a few days or even weeks) and take note of when you feel more excited about certain things. You can think about past experiences as well to see what has made you feel energized before or what kinds of things you are good at.

s in vour working a research job at a university and felt bored out of my mind, but looking at the experience now, I realize it was mainly

because I was very isolated at my job, and human interaction is one of the vital factors that I need to energize me. Your boredom may be caused by something different, so ask yourself what you actually feel when you

You may also think about what your strengths and interests are based on past roles and experiences. What are the things you can't stomach doing for a future job, and what are the things you can't help doing even when you're not asked to? Use this time to prepare for the future and talk to those who may be doing something you think seems interesting. Be curious and be open to possibilities.

And just one more note in case you're in this position: society has constantly fed us this tale of "doing what you love" and "finding your passion," but the majority of people see work as just a way to pay the bills. Perhaps you are okay with work not being your one true passion in life and instead pursuing a passion on the side outside of work. Go for what you want if you know what it is, but it's also okay to see work as just work if you choose to do so.

Reader: As a senior, I'm starting to get a lot of questions about what I'm doing postgrad and I wish people would stop asking. I want to do (still need to find a job first), and sometimes I get really anxious about what I'm going to be doing this time next year. Career fair didn't help either, because they were mostly Course 6 companies. How can I feel less stressed about this?

Tech Support: Addressing the first part of your question, people (especially older adults) often ask what you are doing after graduation as a conversation starter and often don't mean anything by it. I know it can be frustrating, but they may just be curious or simply have nothing else to say, so don't let it affect you too much.

My recommendation would be that you talk to more people. Ask your department for help, or talk to people you already know, such as professors. Talk to people you don't know as well, like alumni or connections of people you do know. People are often willing to help, and the value of talking to others not just for your own information but also to start building your own network — is often underrated. I have been doing this myself lately, and while not every conversation will hit the jackpot, there is always something to learn each time, and I am often surprised by the people I end up connecting with who are willing to help me however they can if I only

It can also be helpful to figure out what don't have my life together or know what I you like doing. Think about your past experiences and what you liked or absolutely hated about work, classes, and extracurriculars. Check in with yourself every so often to find out what energizes you in your daily life. More often than not, you will find that you have strengths and interests that are transferable to jobs. For instance, maybe you find that you really enjoy mentoring younger students in one of your clubs, or maybe you realize that you get energized and feel a lot better after talking to people as opposed to staying in your room. These are all insights that you can leverage during a job search, and they are qualities that are an asset to any

Lastly, don't fret about having seen all the Course 6 related companies at Career Fair, because the world needs non-Course 6 people too. Just because Course 6 is a majority doesn't mean that you are wrong for pursuing your path. And while you should put effort into figuring out post-graduation plans, don't stress out too much about it. Nobody else knows what they are doing either, even if they seem to have a job lined up already, and we're all really just trying to pretend that we have it together. As someone in your early 20s, you shouldn't be expected to have it all figured out, so just take a first step in a direction that seems right for you at this moment in time. Things will change, and that's

# Welcome to CPW, Class of 2023!

#### Prefrosh share their thoughts about MIT

#### By Nathan Liang, Emma Bingham, and Joanna Lin

Campus Preview Weekend has arrived once more! To get their take on MIT, The Tech managed to pull a few prefrosh aside and ask them the following questions:

What is one thing you think is cool, awesome, or exciting about MIT?

What is something cool about you?

#### Emily Sheng, Virginia

"I feel like something that makes MIT stand out is that it has a relaxed atmosphere. Other schools feel more strict about 'this is a liberal arts college; this is the science; this is the engineering college.' Everything is

mixed together and there's more flexibility to choose what you want to do. It also has that relaxed vibe where no one judges you!"

"I just got my permit a week ago, and I'm 18. My friends were shocked that I didn't have it. It's because I failed the permit test once at the DMV, and it scarred me because I was waiting for like three hours at the DMV. I failed the first part of the test — I got one of the signs wrong, and you had to get 10 correct. People were shocked. They would say, 'You can perfectly integrate this problem with partial fractions, but you can't pass the permit test?"

#### Jessie Lee, California

"I think the pirate's license is very cool. Where else can you become a pirate? I heard it's very hard to get into the classes, though."

"I really like American Sign Language. I got into it in elementary school. In our music class, we learned how to cover songs in sign language, and we would sign songs at assemblies. It was just fun to practice signs with friends and communicate secretly."

#### Emily Nguyen, New Mexico

"The people here are really different and quirky and fun. Specifically, I like CPW food events. So far, my favorite food event was cinnamon rolls at Simmons because I got to go in the ball pit."

"I won state tennis in New Mexico. I also haven't met anyone from New Mexico yet."

#### Tomi Siyanbade, Georgia

"The fact that it's really rigorous but at the same time everyone seems really chill. Even the hacking culture — it's not just a bunch of nerdy engineers sitting in their rooms freak ing out all the time."

"I know a lot about fonts. It's not necessarily a hobby; it's just like a pet peeve of mine that grew into an obsession. My favorite font is Times New Roman."

#### Varsha Sandadi, California

"Definitely the people. I went to a really small high school with 200 people in my grade, so it's interesting to see the amount of diversity here. I've been spending the day trying to interact with as many people from as many different states as possible."

"I started watercolor painting in fourth grade. I use Google images to find landscapes to paint. I like painting sunsets and



#### Publisher

Áron Ricardo Perez-Lopez '20

**Editor in Chief** Jessica Shi '21

**Business Manager** Thomas Wang '21

Managing Editor Ivana Alardín '21

**Executive Editor** Nathan Liang '21

NEWS STAFF

News Editors: Whitney Zhang '21, Rujul Gandhi '22; Associate News Editors: Zoe Anderson '21, Sharon Chao '21, Edwin Song '22, Kristina Chen '23, Kerri Lu '23; Staff: Billy Woltz '20, Zoe Sheill '22; Meteorologist: Sarah Weidman '21.

PRODUCTION STAFF

Editors: Eber Nolasco-Martinez '20, Joanna Lin '22; Associate Editors: Kevin Pho '22, Ana P. Reyes Sánchez '22; Staff: Yichi Zhang G, Nicole Teichner '22, Caroline Bao '23, Arthur Reiner De Belen '23, Dean Fanggohans '23, Chloe McCreery '23, Ronak Roy '23, Olivia Schirm '23, Arun Wongprommoon '23, Wenbo Wu '23; Illustrators: Jaeho Kim '20, Max Yu '21.

OPINION STAFF

Associate Editors: Steven Truong '20, Jen Fox '21; Staff: Mark Goldman G, Octavio Vega '22.

SCIENCE STAFF

**Editor:** Jordan Harrod G; **Staff:** Isabel Barnet '22, Anushka Ray '22, Jocelyn Shen '22.

SPORTS STAFF

**Staff:** Ben Kettle '22, Muhammed Suleman Thaniana '23.

ARTS STAFF

Editor: Ivy Li '20; Associate Editors: Shreyan Jain '20, Lior Hirschfeld '21, Liane Xu '23, Erika Yang '23; Staff: Rogers Epstein G, Alexandra Sourakov G, Mariam Dogar '20, Matt Farejowicz '20, Jessica Tang '20, Rona Wang '20, Erica Weng '20, Johnson Huynh '21, Max Langenkamp '21, Lani Lee '21, Nyssa Miller '21, Torri Yearwood '21, Leah Yost '21, Alana Chandler '22, Victoria Dzieciol '23.

PHOTOGRAPHY STAFF

Editors: Ethan Sit '21, Kevin Iy '22; Associate Editor: Assel Ismoldayeva '22; Staff: Mahi Shafiullah G, Leon Yim '20, Maxwell Yun '21, Ether Bezugla '22, Sophia Fang '22, Shinjini Ghosh '22, Alex Li '22, Kevin S. Chen '23.

COPY STAFF

Copy Chief: Adira Balzac '21; Associate Copy Chiefs: Ayomikun Ayodeji '22, Jack Dinsmore '22; Staff: Yaseen Alkhafaji '21, Talia Blum '21, Kendall Yu '21, Pranit Nanda '22, Clinton Reid '22, Sophia Zhi '22, Laura Schmidt-Hong '23.

BUSINESS STAFF

**Staff:** Asia Hypsher '21, Tafsia Shikdar '21, Leon Yu '21, Alvin Zhu '21, Pranit Nanda '22, Steven Ngo '22, Daniel Zhang '22, Amber Liu '23.

TECHNOLOGY STAFF

Director: Tareq El Dandachi '22.

ADVISORY BOARD

Paul E. Schindler, Jr. '74, Barry S. Surman '84, Deborah A. Levinson '91, Karen Kaplan '93, Saul Blumenthal '98, Frank Dabek '00, Satwiksai Seshasai '01. Daniel Ryan Bersak '02. Eric L Cholankeril '02, Nathan Collins SM '03, Tiffany Dohzen '06, Beckett W. Sterner '06, Marissa Vogt '06, Andrew T. Lukmann '07, Zachary Ozer '07, Austin Chu '08, Michael McGraw-Herdeg '08, Marie Y. Thibault '08, Ricardo Ramirez '09, Nick Semenkovich '09, Angeline Wang '09, Quentin Smith '10, Jeff Guo '11, Joseph Maurer '12, Ethan A. Solomon '12, Connor Kirschbaum '13, Jessica J. Pourian '13, Aislyn Schalck '13, Anne Cai '14, Jessica L. Wass '14, Bruno Faviero '15, Kali Xu '15, Leon Lin '16, Kath Xu '16, Anthony Yu '16, Colleen Madlinger '17, Lenny Martinez Dominguez '17, Charlie J. Moore '17, William Navarre '17, Katherine Nazemi '17, Emma Bingham '19, B. D. Colen.

EDITORS AT LARGE

**Senior Editors:** Nafisa Syed G, Christopher Wang G, Josephine Yu '20.

PRODUCTION STAFF FOR THIS ISSUE

Editors: Eber Nolasco-Martinez '20, Joanna Lin '22; Staff: Kevin Pho '22, Ana P. Reyes Sánchez '22, Arthur Reiner De Belen '23, Chloe McCreery '23, Arun Wongprommoon '23; Copy Editors: Adira Balzac '21, Jack Dinsmore '22.

The Tech (ISSN 0148-9607) is published on Thursdays during the academic year (except during MIT vacations) and monthly during the summer by The Tech, Room W20-483, 84 Massachusetts Avenue, Cambridge, Mass. 02139. Subscriptions are \$50.00 per year (third class). POSTMAS-TER: Please send all address changes to our mailing address: The Tech. P.O. Box 397029, Cambridge, Mass. 02139-7029. TELEPHONE: Editorial (617) 253-1541. Business: (617) 258-8324. Facsimile: (617) 258-8226. Advertising, subscription, and typesetting rates available. Entire contents € 2020 The Tech. Printed by Graphic Developments, Inc.

# **OPINION IN REVIEW**

Last year, 2019, marked one of MIT's most contentious years in its history. As an institution, MIT seeks "to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century." However, does such a mission, such an end goal, justify the means? With the unearthing of Jeffrey Epstein's ties to MIT, the passing of David Koch, and many other important events concerning not only MIT but also the whole world, our community of scholars has needed to wrangle with many ethical questions. We may attempt to solve these ethical questions with logic and reasoning, but they are fundamentally

rooted in our individual values, which stem from personal experiences. MIT embraces diversity, and because of that, our diverse perspectives have the potential to be at odds with each other.

The Tech's opinion section is a valuable platform to the MIT community, allowing every individual to share their thoughts, experiences, and stories. When we choose to embrace diversity, we also choose to defend our colleagues' right to disagree with us. Who deserves to fund the potentially life-changing work that MIT produces? How much do we value democracy, and to what extent should we integrate democracy into our institution's decision-making

process? These questions do not have deterministic, logical conclusions. The opinion section's mission is to ensure that our diverse answers are heard in order to fuel healthy, productive discussion. Opinions at a personal and institutional level will inevitably change; the only thing that is constant is change itself. When we look back at these articles and stories — these opinions — we will know what we stood for in 2019. The Tech's opinion department wishes the entire MIT community a meaningful 2020, and we look forward to hearing your voices in this new decade.

—Steven Truong '20 Volume 139 Opinion Editor

#### **GUEST COLUMN**

# Now is the time for MIT to divest from fossil fuels

MIT should not be resisting the divestment movement. It should be leading it

By Owen Leddy

On Sept. 17, the University of California (UC) system announced that it would divest not only its \$13.4 billion endowment from fossil fuel companies but also its \$70 billion pension fund by the end of the month. The UC system is just the most recent and highest-profile of many colleges and universities across the country that have divested from fossil fuel companies. The UC system's commitment to complete divestment of its huge investment portfolio demonstrates that divestment is both feasible and financially sound.

When the UC system's chief investment officer and the chairman of its Board of Regents' Investments Committee announced the decision, they did not cite the moral demands of the global climate emergency, but rather acknowledged that investments in fossil fuel companies are financially dangerous. "We have been looking years, decades and centuries ahead as we place our bets that clean energy will fuel the world's future," they wrote. The U.N.-backed Principles for Responsible Investment organization (to which the UC system is a signatory) argues that policy responses to the climate crisis are likely to dramatically undermine the value of major energy companies that derive the vast majority of their profits from fossil fuel extraction, making investments in these companies risky.

We are asking MIT to divest from fossil fuels because we want to see the Institute excel as a leader in driving the decarbonization of the economy. MIT cannot do that while continuing to place financial bets on fossil fuel extraction. Furthermore, by staying invested in fossil fuels, MIT stands to lose regardless of how the political struggle over decarbonization plays out. Rapid decarbonization will hurt these investments, and if decarbonization doesn't happen quickly, MIT will have bigger problems to worry about than the return on its endow- for example, the fact that its cam. pus will be chronically flooded by rising sea levels in a matter of decades and that the futures of more and more of its students and alumni will be foreclosed by climatedriven scarcity, poverty, and instability.

Of course, this is not just a matter of MIT's self-interest. The climate emergency is a crisis of empathy. It forces us to ask ourselves: Do we care about rural communities whose water is being poisoned by fracking? Do we care about people dying of lung cancer caused by air pollution? Do we care about people facing one cataclysmic storm after another in the Carribean and southeastern U.S.? Do we care about people in California whose homes have burned in unprecedented wildfires? Do we care about people in Guatemala facing starvation due to intensifying droughts and crop blights? Do we care about people in Nigeria being killed and tortured for opposing oil extraction by multinational corporations? MIT should be asking itself all these questions and more — and answering "yes" to every single one.

If MIT does care, it is clear what we as an institution need to do.

By divesting from fossil fuels, MIT can send a strong message that extracting and burning fossil fuels is not just normal commerce — it is deeply immoral and unjust, and it is killing people all over the world. Divestment would be not only the right thing to do, but also a highly effective strategy for action on the climate crisis.

Historically, divestment movements have been a powerful tool for social change, most notably in helping to stigmatize and weaken the Apartheid regime in South Africa. Today, the movement to divest from fossil fuels is gathering momentum, with universities, NGOs, religious organizations, cities, and even countries committing to divest \$11 trillion in total. Fossil fuel companies are beginning to feel the impact on their public image and their finances. As an institution globally renowned for shaping the economy of the future, MIT should strive to become a leader of the fossil fuel divestment movement.

MIT is experiencing a moment of crisis, as the Institute's acceptance of funds from

Jeffrey Epstein has laid bare deep, systemic problems with the way the university finances its activities. Divestment from fossil fuels is a necessary component of any adequate plan for MIT to align its finances with its values. If MIT is serious about financing itself in ways that do less harm to its own community and to the world, it should withdraw its investments from fossil fuel companies and reinvest those funds in clean and renewable alternatives.

For MIT, divestment would not be an especially difficult or onerous process. MIT has its own investment management company (MITIMCo) and therefore would not have to overcome resistance from a thirdparty investment management company, as some schools have, in order to divest. Organizations like the Intentional Endowments Network exist specifically to help guide and support universities through the process of aligning their investment strategies with their institutional values. It would be well worth the time and effort for MIT to take a concrete step toward improving its financial ethics and update its investment strategy for a sustainable future. The UC system and many other schools have managed the transition. Surely MIT is no less capable.

Two weeks ago, the Global Climate Strike brought four million people into the streets around the world to condemn institutional complacency and complicity with respect to the climate emergency. The world has had enough of inaction. The science has been understood for decades. The companies that play the biggest role in driving the climate crisis are known. Divestment provides a clear means to oppose and condemn their destructive practices. MIT should be planning for a decarbonized future, and its investments must reflect that. As an institution proudly committed to science, MIT should do what the data demands: stop supporting climate catastrophe, and invest in a fossil free future.

Owen Leddy is a first year PhD student in Biological Engineering at MIT and a member of the MIT Divest campaign.

#### **OPINION POLICY**

**Editorials** are the official opinion of *The Tech*. They are written by the Editorial Board, which consists of Publisher Áron Ricardo Perez-Lopez, Editor in Chief Jessica Shi, Managing Editor Ivana Alardin, and Executive Editor Nathan Liang.

**Dissents** are the signed opinions of editorial board members choosing to publish their disagreement with the editorial

Letters to the editor, columns, and editorial cartoons are written by individuals and represent the opinion of the author, not necessarily that of the newspaper. Electronic submissions are encouraged and should be sent to *letters@tech.mit.edu*. Hard copy submissions should be addressed to *The Tech*, P.O. Box 397029, Cambridge, Mass. 02139-7029, or sent by interdepartmental mail to Room W20-483. All submissions are due by noon four (4) calendar days before the date of publication.

Letters, columns, and cartoons must bear the authors' signatures, addresses, and phone numbers. Unsigned letters will not be accepted. *The Tech* reserves the right to edit or condense letters; shorter letters will be given higher priority.

Once submitted, all letters become property of *The Tech*, and will not be returned. Letters, columns, and cartoons may also be posted on *The Tech*'s Web site and/or printed or published in any other format or medium now known or later that becomes known. *The Tech* makes no commitment to publish all the letters received.

**Guest columns** are opinion articles submitted by members of the MIT or local community.

#### **TO REACH US**

The Tech's telephone number is (617) 253-1541. Email is the easiest way to reach any member of our staff. If you are unsure whom to contact, send mail to <code>general@tech.mit.edu</code>, and it will be directed to the appropriate person. You can reach the editor in chief by emailing <code>eic@tech.mit.edu</code>. Please send press releases, requests for coverage, and information about errors that call for correction to <code>news@tech.mit.edu</code>. Letters to the editor should be sent to <code>letters@tech.mit.edu</code>. The Tech can be found on the World Wide Web at <code>http://thetech.com</code>

# 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 housGiven 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

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.

# 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

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

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 MIT-SAW. 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

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-

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 cornorate taxes (raising the "carried-interest tax") to Hitler's invasion of

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  $model \ for \ U.S. \ for eign \ policy -- despite \ his$ 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

chwai zman, 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?" For the MIT administration, as for How can we believe that this new college will take justice ethics or morals serious 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.

# Seth Lloyd should not be teaching at MIT

#### Seth Lloyd took money from Epstein. When will he be held accountable?

By Eleanor Graham

I often find myself required to make difficult decisions about my schedule. These decisions range from whether to take a light load and focus on research to whether to drop a technical class and explore the arts, among many broader questions about my graduation and future. Until this semester, however, I have never been asked to decide whether or not I am willing to learn from a man who knowingly took donations from a convicted pedophile.

When I saw Seth Lloyd's name on my registration, as the professor for 18.435 (Quantum Computation), I wanted to believe it was a scheduling error. Two weeks prior, the MIT administration had released a statement that the Institute had taken money from Jeffrey Epstein, with the money going to the Media Lab and Seth Lloyd. I knew he had taught the class in previous years, and I knew MIT could be slow with scheduling. Surely it was a holdover, something they hadn't had time to update after finding a last-minute replacement. Still, I stayed up late that night, reading and rereading Seth Lloyd's public apology on Medium. I decided to go to class with the hope that I'd find one of two things in the classroom: either a new professor, or a reformed Seth Lloyd.

We began our first day of class normally, even as Seth Lloyd stood at the front of the room. We went over the syllabus, raising our hands to let him know if we're course 6, course 8, course 18, course 15. Then he turned to us and said that he was about to talk about something that might be upsetting. "How many of you have heard of Jeffrey Epstein?"

One student in the front row didn't raise his hand. Seth Lloyd frowned at him. "I'm sorry. Some of this material may be shocking if you aren't aware of it, but it's important for you to hear."

There was no opportunity to leave the room. Even though Seth Lloyd recognized that this was a difficult conversation, he did not provide a safe way to exit the situation; just an assumption that whatever he had to say was more important than our own mental health and safety.

Let me be perfectly clear: there was nothing that Seth Lloyd could possibly have had to say that would be more important, not least of all what he ended up saying. The second he used his power as a professor to confine us in that classroom while he monologued for half an hour about his experiences with Jeffrey Epstein, any base that his apologies could possibly have rested on was eroded. There was no information that couldn't have been sent in an optional email

to the class. This was a power play, pure and simple

"How many of you have read my apology on Medium?" Thinking of my sleepless night, I raised my hand. Most of the room kept their hands down. Seth Lloyd looked at us, bemused. "In my freshman advising seminar, everyone looked it up beforehand."

Seth Lloyd is advising freshmen. I don't think this fact has been widely publicized: Seth Lloyd is advising freshmen. The MIT administration has professed its supposed commitment to protecting freshmen from difficult situations. When it came to letting freshmen walk into a room during orientation and receive advice — yes, advice — from a man who visited Jeffrey Epstein in prison, they did nothing. They left incoming freshmen to anxiously read Seth Lloyd's apology on Medium, every last one of them.

No more polls of the class. It was time for the apology, the monologue, the narrative, whatever you want to call it. Like so many others implicated in this scandal inside and outside MIT, Seth Lloyd first met Epstein through his agent, John Brockman. Epstein became Seth Lloyd's research donor and then his friend.

When Epstein was first convicted in 2008, Seth Lloyd reached out to the women in his life for advice on what to do. His wife advised him not to take the money. He looked for a second opinion. His mother worked with atrisk youth in the prison system. Seth Lloyd said that of the students she worked with, the ones who received support were least likely to reoffend. It was unclear to me whether Seth Lloyd actually asked his mother about Epstein's specific case here. I'm assuming not. The idea that a multimillionaire was engaging in pedophilia because he was unsupported by society is laughable.

Still, with this advice in hand, Seth Lloyd decided to visit Epstein in prison to see if he had any intentions of reforming. He noted that by the time he visited Epstein, Epstein was already on partial house arrest, having used his power and status to talk his way out of staying in the prison proper. Seth Lloyd asked the question that he came to ask, and says that Epstein said the following: "I am going to do whatever I have to do not to go back to prison."

At the time, Seth Lloyd interpreted this as a statement of reform from a man that had been scared straight. Now, judging from the meaningful looks he gave the class and the resulting gasps, Seth Lloyd saw it as a harbinger of Epstein's eventual suicide in prison, a decade later. There's a simpler interpretation too: these were the words of a man who was determined to use his power in order to get away with his crimes.

After his release from prison, Epstein slowly returned to hosting conferences and making philanthropic donations. Seth Lloyd claimed that he was happy to see Epstein reintegrate with society and saw this philanthropy as Epstein paying his debt to society. He took Epstein's money, on two separate instances since Epstein's conviction, for two reasons. First, he was still funded by a grant from before Epstein's conviction, so he reasoned that his name was already associated with Epstein. Second, he wanted to do Epstein a favor and support his continued reform by allowing him to pursue philanthropy. He claimed that he was well-funded by existing grants and did not need the money for research, but did use it to take a sabbatical.

Let me reiterate: Seth Lloyd claims that he took money from a "reformed" pedophile as a personal favor to said pedophile. A simple internet search, as Seth Lloyd acknowledges, would have revealed that said pedophile was in fact not "reformed" at all.

Seth Lloyd admitted that he ignored all of the warning signs. He characterized his own mistakes as "crimes of inattention" and acknowledged that he had the privilege to not pay attention while many others had no choice. He said that as soon as he heard the allegations, he cut off ties with Epstein and began trying to make amends with everyone harmed by the situation. He said that he always believes sexual assault survivors, on principle. He drew from examples of students he's worked with as an advisor. He detailed the attempts that he's made to return Epstein's money and support assault survivors. This part is the apology, much of it familiar from the public Medium post.

I don't think Seth Lloyd's apology was any better or worse than the dozens of apologies that we've seen in the past few months from others involved in the Epstein scandal. However, it was directly invalidated by everything else that I saw in that classroom. If Seth Lloyd had quietly directed the class to the online apology, made an anonymous form for comments, and not subjected us to this performance, I don't think I would be writing this article. By not providing a safe way for students to opt out of listening to the apology, by continuing to require mandatory attendance for this semester's class (enforced by only providing the problem sets in lecture), by constantly saying "victims" instead of "survivors" and then loudly correcting himself, Seth Lloyd continued to perform crimes of inattention throughout the entire class, albeit on a smaller scale. What does this say about his capacity to reform?

In his final remark, after the apology, Seth Lloyd returned to the subject of Epstein himself. He said that "Jeffrey Epstein was a charming friend, likeable. I was taken in by it. Nobody should have died like that. He needed to go to trial."

Then Seth Lloyd turned to us, the students. He looked across the room, contemplating us. Few people seemed to meet his eyes.

"What should I do now?" he asked, and is met with silence. An idea occurred to him, as if he suddenly understood why we were quiet.

"If you have concerns that you want to share in private, you can set up a meeting in my office." He seemed surprised, even disappointed, when the silence intensified. As if he was waiting for us to tell him what to do.

Nobody else is going to tell Seth Lloyd what he should do. Nobody besides the students. He was wrong to look to us for advice, but that's not going to keep me from answering

As long as Seth Lloyd teaches at MIT, our institution suffers. The opportunity to study quantum computation should not be restricted by how easily you can put aside your moral discomfort regarding a man who takes money from pedophiles as a supposed act of charity. This is a barrier to learning for survivors of sexual assault, for women (after all, Epstein's survivors are women), and for others upon others. The next generation of scientists depends on precisely the people who are excluded by Seth Lloyd's class.

I hold no resentment towards anyone who continues to take classes from Seth Lloyd. As students, we have been put in a difficult position, forced to choose between our morals and our professional development. We should not have been placed in this situation. MIT should have put its foot down at the start of the semester. I cannot fault anyone for deciding not to take on this burden for themselves, except the MIT administration.

Over and over again, the pattern that emerged in Seth Lloyd's apology is inattention — that he needs to be explicitly told when he has done wrong. This inattention is wildly incompatible with the responsibilities of a teacher and an advisor. It is unacceptable to expect Seth Lloyd's students and advisees to spend their own time and effort reforming him by pointing out every new crime of inattention. If Seth Lloyd is looking to be told by students where he has done wrong, here it is: by continuing to teach, by continuing to advise undergraduate and graduate students, by continuing to be a part of our scientific community, Seth Lloyd is continuing to do harm. Seth Lloyd should not remain at MIT.

Eleanor Graham is a member of the MIT Class of 2020 studying physics.

#### **GUEST COLUMN**

# What was missing at the Climate Policy Symposium

#### Where was climate disinformation during the discussions October 29?

#### By Arnav Patel

Oct. 29 marked the second symposium of the MIT Climate Symposia. Named "Challenges of Climate Policy," the event featured professors and researchers from a variety of different fields revealing their thoughts on the impacts of climate change on national security, equity, global migration, markets, and long lasting societal changes.

Sure enough, urgency filled the air. There was resounding agreement that climate change is a major threat, and that current policy measures are inadequately addressing the issue. There was a consensus on the need to address the social cost, the adaptation, and the prevention of climate change through political mechanisms. Yet, little was discussed on a major reason behind the ineffectiveness of government action, a factor that should be in any discussions related to climate policy—the climate disinformation campaigns pursued by fossil fuel companies.

In the last 15 years, \$2 billion have been used to fund organizations dedicated to lobbying Congress and to supporting climate deniers' campaigns. ExxonMobil knew since the 1970s that climate change would lead to global catastrophe, yet it directly engaged in policymaking to hide this fact. The American Petroleum Institute (API), of which Shell, Exxon Mobil, and Chevron are members, defined victory as when "recognition of uncertainties [of climate science] becomes part of the

'conventional wisdom." Other organizations like ALEC and WSPA view the development of climate science and science-based climate change education as a direct threat to their own abilities to succeed.

In a three hour set of panel discussions on the challenges of climate policy, only two and a half minutes (by Dr. Laura Stokes in the mitigation panel) were used to discuss climate denial propaganda. Big campaigns driven by fossil fuel companies to write misleading articles, engage with media to spread their opinions, and work with government officials negatively influences environmental progress. The past and present effects of climate disinformation should be getting more attention. MIT had (and continues to have) an opportunity to make a focal point out of it, and it is deeply unfortunate that it chose not to engage in such a discussion at this specific and relevant symposium event.

Climate disinformation should be discussed as a major problem, not only because of how wrong it is, but how effective it has become. The drop in climate change believers and governmental action on protecting the environment in the 2000s was heavily influenced by conservative think tanks funded by fossil fuel companies. It would be a logical step to assume that fossil fuel companies and their respective campaigning organizations. More than just lobbying our government, they have worked to influence education and social understanding, even to those as young as

kindergarteners. The scientific and research community is aware of climate change because that community is exposed to the real facts. The average person is not. These companies want to create a large population fueled by ignorance to blindly defend them from those that want to hold them accountable.

As a response to the initial divestment movement from a few years ago, the MIT Climate Symposia were meant to answer questions regarding the changing climate. The fact that a series of panels dedicated to discussing climate policy did not engage in a conversation on climate disinformation is disappointing. Policy can only work if our policymakers and their constituents are not hearing continuous lies and propaganda brought forth by fossil fuel companies interested primarily in their own survival.

So even though the MIT Climate Symposium did not mention climate disinformation as much as it should, this is your reminder that it continues to exist. It continues to be a dark stain upon the environmental progress of our nation and the world. It continues to harm the world's ecosystems, the cities that we live in, and each and every one of our futures. And at the end of the day, MIT should have no part of that. We must engage in conversation surrounding this problem and propose the way that MIT can respond to it.

And the best response for MIT is divestment: our school should divest its endow-

ment from fossil fuel companies. Divestment would entail a removal of any MIT investments in fossil fuel companies that continue to advocate for climate denial and policy that does not represent the best interests of the American people.

MIT is an institution dedicated to education and the spread of knowledge. Quite literally, our university's mission is "to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century." Over \$1 billion of shareholder investment in fossil fuel companies goes towards climate policy lobbying on behalf of these entities. MIT, unfortunately, invests part of its endowment into this horrible, destructive practice — an ironic and hypocritical activity. MIT considers itself to be a global scientific leader, and by investing in companies that engage in disinformation, MIT goes against everything it stands for.

President Reif, in the first symposium, said we needed something "new" to tackle the problem. The MIT Climate Action Plan has failed to do something "new." So let's try something different. The MIT community deserves better from its leaders.

MIT needs to divest from fossil fuels. Sign our petition and join our movement.

Arnav Patel is a member of the MIT Class of 2021 studying mechanical engineering. He is the publications co-director for MIT Divest.

R8 THE TECH
THURSDAY, FEBRUA

## **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 population. 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 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 A**

Three construction we sent to the hospital after a during the construction Vassar Street Residence. Odied while the other two non-life-threatening inju-

2019

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 HUT

Dan Hutt founding dea was named d of Computir

8/15/

COC

group

struct

progr

Co

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 CONCENTRA-TION 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.

#### 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 DON** 

Jeffrey Epstein \$800,000, were un Ito apologized for

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.

ceive MIT assau stude man

STA

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.

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.

2020 –

12/19/19

#### HAYDEN LIBRAR CLOSES

Hayden Library cle 19 and will reopen So 2020. The renovated s include include a ca new group study roo a flexible event and space.

4/17/19

#### 6-9 MAJOR APPROVED 4/3/19 The Computation and Cognition bach-**INTERNATIONAL PRO**elor's degree is a joint program between EECS and BCS. The degree has two tracks: neural 3/12/19 **POSAL REVIEW PROCESS** systems and human and machine intelligence. TRUMP TWEETS MIT 2/28/19 MIT instated a new review pro-After a Boeing 737 Max cess for "elevated-risk" interna-COLLEGE OF COMPUT-8 plane crash in Ethiopia, tional proposals, which includes ING CELEBRATION Trump tweeted, "Airplanes potential review by the Senior Risk 4/17/19 CCIDENT are becoming far too com-MIT held a three-day cele-Group, a new body whose focus 22-ENG MAJOR APPROVED bration for the College of Complex to fly. Pilots are no longer is risk evaluation. As a part of the orkers were an accident process, MIT decided it will not The Flexible Nuclear Science and Engiputing Celebration. Outside, needed, but rather computer scientists from MIT." MIT neering degree includes 72 units in a studentprotestors decried Henry Kissof the New accept new engagements or renew CSAIL responded, "We're very One worker inger's speaking invitation, doexisting engagements with Chichosen focus area. Focus areas include nuclenor Stephen Schwarzman, and ar medicine, energy systems, nuclear policy, happy to help. But maybe we nese telecom companies Huawei sustained can keep the pilots, too?" fusion, and quantum computing. MIT's defense research. and ZTE. ıries. 3/2/19 3/30-3/31/19 5/1/19 TENLOCHER **ROOMING ASSIGNMENT DESIGNS GOODBYE SUBWAY COURSE 7 MODIFIED** enlocher PhD '88, Undergraduate dorm leaders met with Chan-The Stratton Student Center Sub-The biology department consolidated course 7 and way closed "abruptly due to issues n of Cornell Tech, cellor Cynthia Barnhart PhD '88 and Vice Presi-7A, split 7.02 into 7.002 and 7.003, and discontinued 7.18. ean of the College dent and Dean for Student Life Suzy Nelson to between Subway's parent company The number of units in the major has decreased from discuss new dorm assignment procedures. The and the franchisee that ran the W20 141-144 to 126. The changes are intended to accommodate the increasing number of students pursuing interprocedures were required to not involve mutual location," Mark Hayes, director of selection and to allow first years to squat their MIT dining, wrote in a statement disciplinary majors or participating in UROPs. initial room assignments. emailed to The Tech. 6/6/19 GALLAGHER REVIEWS WAIVERS 5/3/19 MIT Student Health Plan announced that it would use Gallagher **NEW STUD STUDY** Student Health to waive insurance requirements. Since fewer stu-TASK FORCE After months of renovation, the former Athena clusdents may have been able to waive the extended plan, MIT Student llege of Computing Task Force working Financial Services increased the financial aid budget to cover insurter on the fifth floor of the Stratton Student Center refinal reports developed new ideas for the ance costs for students with "high financial need," Dean of Admisopened as a study space. The new study space features sions and Student Financial Services Stuart Schmill '86 wrote in an modern furniture, a blue and green color scheme, aduring, staffing, supporting, and curricular ditional light fixtures, and glass and whiteboard walls. amming of the college. email to The Tech. 6/20/19 5/5/19 ATIONS REVEALED **WASHLAVA TUMBLES MUTUAL SELECTION** MIT ends mutual selection starting Fall 2019: upper-'s donations to MIT, totaling New Washlava washers and dryers replaced old laundry machines covered. Media Lab Director Joi in several dorms. The per-load cost of laundry increased from \$1.00 to classmen can no longer rank their choice of new students \$1.25. Payment changed from cash or TechCASH to the Washlava moplanning to reside in their living communities. Nelson said his involvement. bile app. Several dorms experienced difficulties integrating the new in an interview with The Tech that mutual selection contribsystem, as washers and dryers were temporarily unavailable during the uted to a "sense of rejection that a minority of students felt" Washlava installation period. Many students complained about shaky and was "out of step" with MIT values. support for TechCASH and inconsistent service. 9/18/19 LLMAN RESIGNS **FACULTY MEETING** 10/11/19 siting scientist at CSAIL Richard Stallman re-Discussions of MIT's engagement with Epstein **COMMENCEMENT STRUCTURE STAYS** d backlash for his blog post defending late took center stage at the first faculty meeting of the professor Marvin Minsky, who was accused of fall semester, with professors' sentiments ranging Following undergraduate and graduate feedback, Academic alting an Epstein victim. Reactions from MIT from sympathetic to critical. Concerns about the Council decided to keep Commencement the same for the Class ents and other CSAIL affiliates resulted in Stallpresence of misogyny and the integrity of the Instiof 2020. Potential changes are still being considered for later 's resignation. tute were raised. classes. 9/13/19 10/1/19 **PROTEST** STUDENT FORUM **OUTSIDE ENGAGEMENT COMMITTEES** Over 200 students, researchers, professors, and MIT undergraduate and graduate students The Ad Hoc Faculty Committee on Guidelines for other members of the MH community gathered to expressed their disappointment and demanded Outside Engagements and Ad Hoc Committee to Review protest MIT-Epstein relations, claiming that the ad-MIT Gift Processes were created to recommend guidechange at a student forum. Reif, Barnhart, and Nellines for MIT's relationship with donors. ministration was aware of Epstein's gifts. The twoson were present. hour protest culminated in a march to Reif's office. 10/29/19 12/19/19 10/31/19 10/24/19 **STUDENT COMMITTEES NEW VASSAR NEW GRADUATE REIF ANNOUNCES** UA and GSC created the Student Steven Hall, professor of aeronautics **RESIDENCE REFORMS** Committee on Guidelines for Outand astronautics and associate head of MIT announced that beosed Dec. In an email to the MIT commuside Engagements and the Student house of Simmons Hall, was appointed

ginning in 2021 or 2022, it will

expand west campus graduate

housing to add 550 beds. The

new building will be located

between Simmons Hall and

the MIT Police station.

eptember

space will

afé, eight

oms, and

teaching

nity, Reif announced reforms that

included creating committees to

evaluate gift acceptances and out-

side engagements, increasing pro-

tection for whistleblowers, selecting a charity for survivors of sexual

abuse, and encouraging more em-

ployee involvement.

Committee on Campus Climate and

Policies around Discrimination and

Misconduct.

head of house for the New Vassar Street

Residence. Barnhart and Nelson also an-

nounced that they will formally charge a

New Vassar Street Residence Founder's

# HOUSING

Thursday, February 06, 2020 R10 THE TECH

# **SCIENCE IN REVIE**

Entering its third year at *The Tech*, the science department highlighted both the novel discoveries and technological innovations of MIT's researchers, as well as their personal successes and challenges. The Tech started off 2019 by covering the shutdown of the federal government and its effects on MIT researchers. Later in the year, we shared in the excitement of the wider

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

Much of our coverage also emphasized the day-to-day activities of researchers at MIT. From understanding wave equations, to building better biomaterials, to developing new methods of watching and influencing the brain's natural processes, we followed graduate students and professors through their research journeys to where they are today. We'd like to thank

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

On behalf of the science department, we hope that you enjoy this selection of this

> — 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

By Robert Koirala

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.

"When I was an undergraduate in Università di Bologna in Italy, I had to take basic classes in different fields like algebra, analysis, and geometry. I really did not like algebra because it was too rigid - things are either equal or not. In contrast, analysis is mostly inequalities. Algebraists might disagree with my view, but in analysis there is room to solve an easier problem with less strict inequality before solving a bigger problem," said Staffilani. As a graduate student at the University of Chicago, Staffilani had to choose between two research topics for her PhD thesis. One was in geometry, focusing on elliptic partial differential equations (PDEs). The fundamentals of PDEs had been thoroughly researched at the time, but there were higher level problems left to be solved. The other project was in analysis, focusing on nonlinear wave equations. Her advisor, who was an expert in elliptic PDEs, had started working on it from analysis point of view. "At that time, I was mostly concerned about finishing my PhD thesis, so I picked the second option which had more problems. I didn't care if that was going anywhere

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."

An example of a nonlinear wave equation that Staffilani worked on is one that governs the Bose-Einstein Condensate. The Bose-Einstein Condensate is a state achieved when a dilute gas made up of particles called bosons is cooled down near to absolute zero. As the temperature is lowered, the particles start to interact with each other as a result of quantum effects. In particular, bosons interfere with each other like light waves from different sources. Considering the quantum effects, it is better to model particles as waves. Mathematically, these waves are represented as functions that depend on time and space. The wave functions that models bosons are governed by a nonlinear system of equations called the Gross-Pitaevskii hierarchy. Even though we know the governing equation, we can't get an explicit solution to the equation. This means we don't know how the state of particles evolves with time. So, we can't make a mathematical prediction of the behavior of bosons. However, there are numerical. experimental, and analytical ways to predict what a solution must look like. Based on the implicit properties of the solutions, the Bose-Einstein Condensate can be modeled

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 constituent parts that are better understood. For instance, functions can be decomposed into sines and cosines (also called the Fourier transform of the function). Based on the properties of these familiar functions, she deduces the properties of bigger and more complicated functions. Staffilani tries to understand periodic solutions to the wave equation that governs the Bose-Einstein Condensate. Mathematically, the nonlinear aspect makes it harder to study periodicity. The decomposed parts of the solutions - sines and cosines if we are using Fourier Transform — appear as products. Generally, it is harder to keep track of the period of functions in product form. However, we can attribute the periodicity to the constraint imposed by the physical boundary on the system of particles. We can think of a periodic function as some wave in a box that hits the wall and comes back. If we could understand the properties of an implicit periodic solution to the wave equation, we could understand more about the time evolution of the Bose-Einstein Condensate.

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

the counterexamples manufactured by the fact that we are approaching the problem in a certain theory trying to use certain types of tools or are they really due to intrinsic problems in physics?" Probability helps in making generic claims about the solutions to the wave functions. For instance, we could say that for "almost all" initial states of the physical system, the wave function representing the system must evolve in a particular way. The counterexamples that show up in mathematics could be thought of as "isolated phenomena that don't really represent physical phenomena." Using probabilistic tools, one might also predict phenomena that could exist with a very low probability of

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

By Jordan Harrod

Consider the following thought experiment: Person A and Person B, on a tour of a chemical factory, stop to take a coffee break. Person A finds a pot containing white powder — a powder which is actually sugar, but is labeled "deadly poison." Person A put some of this powder into Person B's coffee; Person B drinks it and remains perfectly healthy.

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?

Questions like these and more drive professor Rebecca Saxe's research in the McGovern Institute for Brain Research. Saxe, also the associate head of the Brain and Cognitive Sciences Department, posed this "deadly poison" hypothetical to the audience of her 2009 TED talk, "How we read each other's minds." Her lab focuses on understanding social cognition and the development of the human brain. As Saxe explained in her TED talk, the job of a cognitive neuroscience researcher is "to understand how you can put together simple units — simple messages over space and time — in a network and get this amazing human capacity to think about minds."

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,

displays increased activity when individuals think about what others are thinking, but not when they perform other mental tasks. In 2005, Saxe published a paper in Neuropsychologia highlighting the role of the RTPJ in such cognitions. "It's become known as part of the theory-of-mind network," said Kosakowski, and a central question that remains is "how does that [network] develop or emerge?"

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.

In order to uncover the neural mechanisms underpinning infant cognition, Kosakowski is expanding on a project originally conducted by Saxe and her former graduate student Ben Deen. Using functional magnetic resonance imaging (fMRI), Saxe and Deen measured babies' responses to different visual categories, such as faces and scenes. Although Saxe and Deen discovered similarities between the locations and levels of neural responses in infants and adults, their study only included data from nine babies.

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

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 resulting 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 train tory, 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 Mc-Govern 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 vet." 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 in 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 White-head 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 yearslong 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-ofprinciple 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. R12 THE TECH Thursday, February 06, 2020

# 

# ARTS IN REVIEW

has stayed with us is our love of the big screen. We watched, laughed, and cried at the great films of 2019 and the 2010s, covering films that made their way as our favorites and fondly remembering those that defined a decade. Comedy and drama, highbrow and lowbrow,

The Tech arts department covered a wide range of media in its past volume, but what cinema has hit emotional beats time and time again, challenging aesthetics while reckoning with human existence.

> −Ivy Li '20 Volume 139 Arts Editor

# **Our Favorite Articles from 2019**

# **Love is Calling**

By Ryan Conti

With "Love is Calling," Yayoi stamps another beautiful footprint into the sandy beach of her oeuvre. The exhibit is a piece of environmental art that attempts to immerse viewers, who enter a room that contains only three things: spotless mirrors on every surface, tentacle-like sculptures that dance with neon gradients, and themselves. The viewer's place in the installation is especially emphasized to prompt introspection, although this detracts from the piece's immersive capabilities.

Upon entry, "Love is Calling" breaks

expectations. The pulsing sculptures are even more vibrant in person than in video. The murky reflective material on the floor and ceiling gives the sense that a pristine world laden with effulgent stalagmites and stalactites lies just beyond the room. At the same time, the synthy lo-fi beats that one might assume to be concomitant with such minimalist, psychedelic figures are nowhere to be found. In their place is the poised voice of Yayoi Kusama reciting "Residing in a Castle of Shed Tears" in Japanese against the whir of air pumps that presumably breath life into the tentacle sculptures.



Yayoi Kusama's "Love is Calling" arrives at the ICA in September to bring an immersive, kaleidoscopic environment.

#### **MOVIE REVIEW**

# The Farewell

By Lulu Tian

Distinct and nostalgic qualities of China are excellently captured by the cinematography. Billi's arrival in China is signaled with shots of endless tall, identical apartment buildings set against a gray sky, eventually leading to the generic block-colored apartment complex that Nai Nai lives in. This visual impression is starkly different from the previously shown New York City, with Billi walking past graffiti covered walls and alleyways. The film is decorated with more small details that are so characteristically Chinese, from patterned wallpa-

pers and blankets to paintings of flowers and posters of random babies. With colors and shots that feel calm and comfortable, Wang creates a special tone for the movie that can only be described as personal.

The set design generates powerful juxtapositions that supplement the plot. The dramatic irony surrounding Nai Nai's illness is accented by brightly colored wedding photo-shoot props and pastel balloons, popping out in a tacky way against the relatively muted colors of the general landscape. Bustling family gatherings are punctuated by visuals of uncomfortable, smothered expressions.



COURTESY OF SUNDANCE FILM FESTIVAL

Awkwafina stars as Billi in Lulu Wang's The Farewell.

# **MOVIE REVIEW**

By Shreyan Jain

ASSOCIATE ARTS EDITOR

The Us of the film is double, just like the film's doppelgangers; it refers both to the "us" of the Wilson family, and to the broader "U.S." that is the country most of us call home. In that way, Peele's film can be read as an explication of the doubleconsciousness of America itself, a nation that has conveniently chosen to forget and escape its tainted, troubled past and, in doing so, has neglected half of itself. Just like Adelaide then, we too are due for a violent reckoning. Us is nothing less than an allegorical documentary of Trump's America, an investigation of the rifts, divides, and walls that separate us from the people who are just like us. It's no accident, then, that Peele revisits the sweeping green imagery of The Shining with an incredibly appropriate modern twist in his chilling final

Peele's decision to revisit the horror genre for his second film is unsurprising, not just due to the nature of his message

clearly has mastery over. Peele understands the Hitchcockian lesson that suspense isn't blowing up a bomb at a dinner table; rather, it's telling the audience that a bomb will go off under a table in 15 minutes and reveling in the juxtaposition of their agonized anticipation against the characters' own ignorance. Peele eschews conventional jump scares (for the most part) in favor of slowly developing moments of amplified tension, delicately playing the camera to the audience's expectations. Nowhere is this more apparent than in the scene where Adelaide's husband, Gabe (Winston Duke), confronts his doppelganger on a jittery boat in the middle of a murky lake at night, a scene that pays homage to the original suspense blockbuster Jaws. An incredibly haunting score and exceptional use of editing bring everything together - Peele clearly knows the value of cutting way from a shot of built up mystery (like the back profile of a bloody man standing on a beach, or that of the young girl in the

but also because the genre is one that he



CLAUDETTE BARIUS/UNIVERSAL PICTURES

Lupita Nyong'o stars as Adelaide Wilson's doppelgänger Red in Us, written, produced and directed by Jordan Peele.

Townspeople and adjudicators gather around Reverend Hale (Eric Tucker) as he reads, "Here is all the invisible world, caught, defined, and calculated."

#### funhouse) before giving too much away. THEATER REVIEW The Crucible

By Alexandra Sourakov STAFF WRITER

Arthur Miller did not undertake the writing of The Crucible as a mere exercise in historical fiction. In the 1950s. in the midst of the trials of the House Committee on Un-American Activities, he was only too keenly ruminating on certain phenomena of human behavior. Events that make you wonder why no one stepped in, why no one called out the ludicrous and harkened society back to reason. Moments when victims have no rational means to defend themselves and accusers stand only to gain from pointing

Director Eric Tucker immerses us into the claustrophobic confines of a

little village, not too far from here, where the Salem witch trials took place. And you won't get to slink away into the anonymity of a quiescent audience member. You're one of the villagers, but far enough removed that you can observe the hysteria without fearing for your life. Before the play starts, you're sucked into the small-town atmosphere as the actors stroll through the audience, shaking hands, warmly welcoming you, and asking after your health. Throughout the play, the audience is the ubiquitous "Crowd" that is inevitably present in the town square, in the courtroom, in the bedroom. The actors will make you feel like they are speaking directly to you, making eye contact, and projecting their indignation or vehemence towards you in courtroom speeches and personal appeals.

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.



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.

#### 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

#### **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.

—Shreyan Jain

#### 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

—Erika Yang



Laura Dern and Scarlett Johansson star as Nora Fanshaw and Nicole

# **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.

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



## Toy Story 4 (Josh Cooley)

Since Toy Story's beginnings in 1995, the charismatic cowboy and space cadet duo has charmed children ts alike While Toy Story 3 may hay 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

#### 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.

#### **Parasite** (Bong Joon-ho)

From comedy to suspense to political satire, Parasite slips through genres so smoothly and effortlessly that it feels almost natural when the film erupts into violence in its climactic third act. Therein lies Bong Joon-ho's genius: by crafting a story that slowly raises the stakes, imparting more and more weight to the unspoken burdens and casual microaggressions that characterize the everyday life of the destitute Kim family, he immerses his narrative in an atmosphere of inevitability, as if violence is the only logical end for a society structured around rigid, oppressive hierarchies. Parasite is one of the rare films in which every single element falls perfectly in place. The screenplay is brilliant, the acting spectacular, and it even features one of the best uses of montage in recent memory. But what really makes Parasite the film of the year is how it boldly flips the narrative of contemporary class relations on its head: in a world where people like the Parks depend on their exploitation of poor families like the Kims to thrive, the wealthy have become the true parasites of society.

-Nathan Liang

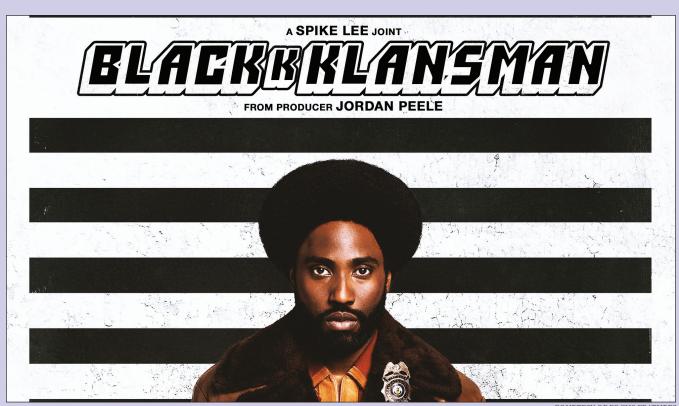
R14 THE TECH Thursday, February 06, 2020

# **Our Favorite Films of the Decade**

#### BlacKkKlansman (Spike Lee)

Watching BlacKkKlansman is like stepping through a twisted time machine. The film tells the story of Ron Stallworth (John David Washington), Colorado Springs' first African American police officer, as he attempts to infiltrate the KKK, along with the help of his partner, Flip Zimmerman (Adam Driver). Despite its serious subject matter, BlacKkKlansman is extremely funny, seamlessly transitioning between moments of humor and tension, and strong performances by its two leads produce a compelling narrative. Most exceptional though, is the movies timeliness. Though discussion of the Klan's hooded cloaks is now often relegated to history books, BlacKkKlansman is filled with imagery of prejudice and violence that are all too familiar to modern audiences. Spike Lee forgoes subtlety for sharp, direct criticism, concluding the film with chilling footage of the Charlottesville rallies that forces viewers to ask: How far have we really come?

—Lior Hirschfeld



John David Washington stars in BlackkKlansman.



Ellar Coltrane as Mason in Richard Linklater's new movie Boyhood.

#### **Boyhood** (Richard Linklater)

Before Scorsese's de-aging technology in The Irishman, Richard Linklater filmed an epic story spanning twelve years in the most straightforward way: over twelve years. Ellar Coltrane plays a boy named Mason Evans from the ages of six to eighteen, while Patricia Arquette and Ethan Hawke deliver stunning turns as his divorced parents. (Arquette won an Academy Award for her part, and Hawke was nominated.) Boyhood's power comes not from any dramatic emotions or extraordinary artistry, but from its simplicity: it simply follows Mason as he grows up. However, although this one boy's journey is unique, there is something about it that  $% \left( 1\right) =\left( 1\right) \left( 1\right$ is universal. You will laugh and cry precisely because you feel this type of attachment to Mason. Boyhood is not just a one-of-a-kind movie. It's also a one-of-a-kind experience: the experience of growing up, the experience every person goes through and every parent witnesses. The only difference is that all those years are beautifully packaged into a three hour film.

—Liane Xu



Parasite has been nominated for six Academy Awards, including Best Picture, Best Director, and Best Foreign Language Film.

#### COURTESY OF NEON CLENTERTAINMENT

#### Her (Spike Jonze)

Her is one of the most beautiful films created. Every single scene was crafted with the utmost care and attention to detail, and the film is nothing short of pure art. Never has loneliness looked so aesthetically appealing. The colors are both drab yet colorful, highlighting the central theme of loneliness the main character, Theodore, feels. Her is not on this list for its beauty alone, however. Joaquin Phoenix delivers an unparalleled performance in what is - for a large majority of the movie - a one-man show in terms of physical presence. Theodore is a relatable character for much of the general audience at some point in their lives: the mundane life of a person who is just going through the motions. It really strikes a chord with viewers, and Phoenix portrays this condition with a precise and empathetic quality. Scarlett Johansson is certainly not to be trivialized in her role as the voice of Samantha, the AI that Phoenix's character falls in love with. Despite only having control of her voice, Johansson manages to create such depth in an artificial intelligence helper that you can see why an actual human could fall in love with her. With Her, Jonze created an exquisite film about the beauty of letting go, but we certainly couldn't let this film go from our top ten list.

—Erika Yang

#### **Get Out (Jordan Peele)**

To simply call Get Out a horror film is to do a grave injustice to Jordan Peele. While the film certainly plays with the familiar tropes of the genre - the house in the woods, the feeling of being watched, the unexplainable nighttime occurrences - Peele goes to painstaking lengths to create just enough ambiguity that Chris, and by extension the audience, never stops thinking he's simply being paranoid...until it's already too late. The genius of Get Out is how it seduces us into thinking that a black man can ever feel fully comfortable in his own skin, before pulling the rug out from underneath us again and again. The result is an emphatic refutation of the possibility of a post-racial America, one that rips apart the very notion that electing an African-American president could ever redeem centuries of violence against black bodies. After all, as that iconic hypnosis scene so brilliantly visualized, even our most buried traumas lurk just beneath the surface. If for no other reason than the fact that few other films did as much to change the critical language for thinking about race relations in contemporary America, Get Out deserves a place on this list; it also just so happens to be one of the funniest, scariest, and most entertaining films of the decade.

—Shreyan Jain

#### The Grand Budapest Hotel (Wes Anderson)

Wes Anderson's works feel less like films and more like paintings that have come alive. The vivid, saturated color palettes, his distinctive planimetric shots, and the unrestrained, almost child-like exuberance with which he approaches storytelling all work together to give the dazzling impression that his films take place in worlds that are more imagined than real, almost as if his characters have jumped into the pages of a coloring book. With *The Grand Budapest* Hotel, Anderson puts his filmmaking skills on full display while simultaneously turning them into the very object of his critique. The film, whose narrative structure may best be described as a series of nested Russian dolls with its repeated flashbacks, framing devices, and remembrances, constantly reminds us that although the world we experience may look and feel like 1930's Eastern Europe, it is nothing more than a figment of Anderson's own imagination, refracted through the cloudy memories of his characters. What unfolds is an incredibly deep and self-aware meditation on the nostalgic nature of art itself: an examination of the ways we try, perhaps futilely, to make sense of a past tainted by violence and trauma. The Grand Budapest Hotel was one of the defining films of the decade because it reminded us of why we watch cinema in the first place: to see the world differently than it is.

—Shreyan Jain



Christopher Nolan weaves his dream world.

#### Inception (Christopher Nolan)

*Inception* is a film that has garnered endless praise since its inception onto the big screen. Exploring the concept of a world taken by dreamscape politics by following Cobb (Leonardo DiCaprio) and crew gives way to an increasingly complex and thrilling story. There is so much to the world of Inception that one can read into through its symbolism and subtle details, thanks to the careful direction of Nolan and Pfister's beautiful cinematography. From Arthur's (Joseph Gordon-Levitt) exploration of the paradox in dream structures to Ariadne's (Ellen Page) bending of dream physics, the structures in Nolan's world of Inception make for scenes we can never quite forget. It also wouldn't be right to mention *Inception* without talking about Hans Zimmer's iconic soundtrack, compelling the film with an appropriately dramatic soundscape that also complements the notable acting talent of the all-star cast. At the end of the day, there is a reason why the ending of the film has one of the most contested interpretations in film history. Do we ever know for sure if our current reality is within a dream?

—Nathan Liang

#### **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



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

#### Spiderman: Into the Spiderverse (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 selfdiscovery 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 resounding 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



R16 THE TECH

