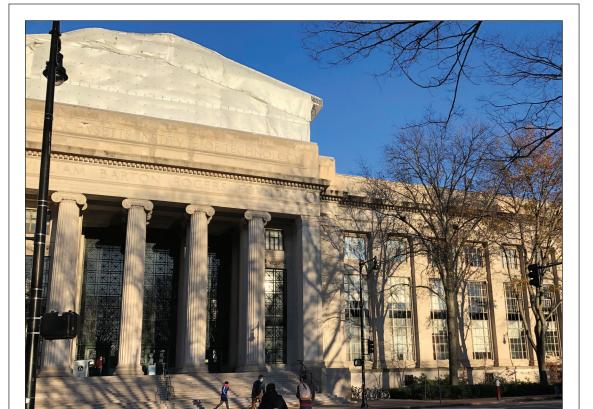
thetech.com

Volume 140, Number 41

WEATHER, p. 3 Mostly cloudy. SAT: 44°F | 32°F

Thursday, December 3, 2020



Pedestrians cross Mass. Ave. as the fall semester comes to a close.

HRS Spring housing placements delayed until late December

HRS received a 'high volume' of student spring housing applications

By Kerri Lu and Wenbo Wu

Undergraduate housing placements for the spring have been delayed until the "end of December," Director of House Operations Rich Hilton wrote in an email to students Nov. 23. The placements were originally scheduled to be released Nov. 20 and were initially delayed to Nov. 24 before being further delayed to

Hilton wrote that because positive COVID-19 cases are rising throughout the U.S., MIT "must approach building placements and residential density extremely carefully" to "prevent the number of residents placed in each house from posing an increased risk of spreading the virus."

Furthermore, Housing and Residential Services (HRS) received a "high volume" of spring housing applications and expects that "students' housing plans may change during the course of the coming weeks." Students may cancel their on-campus housing through a form in MyHousing portal without penalty until Jan. 1.

Hilton wrote that students who no longer require spring on-campus housing should complete the cancellation form "as soon as possible" to provide HRS "a more accurate understanding" of housing needs and to "better accommodate" students "who have committed to on-campus

"By waiting a few more weeks to have a more complete handle on the true demand for MIT Housing, it's our hope that we can make placements in mid-December and avoid reshuffling residents' assignments in January to help bal-

Housing, Page 2

Spring grading also under A, B, C, D/NE, and F/NE system, including optional PE/NE class

Unlike the fall, Junior-Senior and Graduate P/D/F options will also become available for the Spring 2021 semester, Danheiser wrote in an email Nov. 30

By Kristina Chen

EDITOR IN CHIEF

Sophomores, juniors, seniors, and graduate students will receive A, B, C, D/NE, and F/NE grades in the spring, according to a Nov. 30 email from Rick Danheiser, faculty and Academic Policy and Regulations Team (APART) chair. NE grades appear on internal grade reports but not on external transcripts.

First year undergraduates will be graded under the usual A, B, C, D/NR, and F/NR system for the spring semester.

Similar to Fall 2020, all students ay choose one subject to be graded PE/NE, and sophomores may designate one subject as Exploratory. Unlike the fall, Junior-Senior and Graduate P/D/F options will be available in the spring.

As in the fall, upper-level students who receive a D/NE grade may choose to accept a D grade "to fulfill a requirement for graduation" or "accept the default" for the class to not appear on their external transcript, Danheiser wrote. This option is not offered to first years who receive a D/NR or D/NE

Danheiser announced in an email to the MIT community June 25 that a "Significant Disruption" would be in effect for Summer 2020

and the 2020-21 academic year.

NATHAN LIANG — THE TECH

Section 2.64 of the Rules and Regulations of the Faculty writes that PE indicates an A, B, or C level performance during a Significant Disruption; NE indicates a D or F level performance "for which no record will appear on the external transcript"; and IE indicates that a portion of the subject requirements are unfulfilled "due to a major disruption of the Institute's academic activities."

Danheiser wrote in the Nov. 30 email that the spring grading policy is "largely based" on MIT's fall policy, which was developed after reviewing the Undergraduate Association (IJA) report on Fall 2020

grading options and a report from the Academic Policy Solutions Group of the Graduate Student Council (GSC).

APART also met with students from the UA and GSC and deans of Student Support Services, and received survey feedback from 29 departments and academic programs for the fall grading policy.

Danheiser added that "a longer, detailed version" of the policy would be available online "within the next two weeks.'

Grading for Independent Activities Period, also using A, B, C, D/ NE, and F/NE grades for upperlevel students, was announced

IN SHORT

Pre-registration for Spring and IAP is currently open. The deadline to initiate pre-registration for the spring and to complete pre-registration for IAP is 5 p.m. Jan. 4. Spring pre-registration closes 5 p.m. Jan. 29.

Dec. 4 is the last day an assignment may be due or a test may be given for classes with final

The last day of classes is Dec. 9.

End-of-term subject evaluations may be completed until 9 a.m. Dec. 14.

The final exam period is Dec. 14-Dec. 18.

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Send news and tips to news@ tech.mit.edu.

MIT seniors Grey-Stewart, Alshalan named Rhodes Scholars

Total number of MIT Rhode's Scholarship recipients has reached 61 over the course of Institute's history

By Nicole Chan

ASSOCIATE NEWS EDITOR

Danielle Grev-Stewart '21 and Ghadah Alshalan '21 have been named Rhodes Scholars for 2021.

The Rhodes Scholarship awards over 100 fully-funded scholarships for one to three years of graduate study at Oxford each year, including

32 scholarships for U.S. citizens. Sixty-one MIT students have received the scholarship since it was first awarded in 1904.

Grey-Stewart was named a U.S. Rhodes Scholar. Alshalan was awarded the Rhodes Scholarship for Saudi Arabia. Up to three Rhodes Scholarships for Saudi citizens are awarded annually.

Danielle Grey-Stewart:

Grey-Stewart is a senior majoring in Course 3. Grey-Stewart's current research focuses on "functionalized nanothread synthesis" in the laboratory of Professor Julia Ortony in the materials science and engineering department, according to MIT News. In the past, she has also conducted research on photoinitiator nanoparticles in the department of chemistry and biodegradable architectural materials in the MIT Media Lab Mediated Matter

Outside of class, Grey-Stewart chairs the MIT Undergraduate Association Committee on COVID-19, writes articles on COVID-19's impact on sustainability for the MIT

Environmental Solutions Initiative Rapid Response Group, and participates in the MIT Student Advisory Group for Engineering. She has also taught STEM classes to students in France through MIT Global Teaching Labs and worked with community health partners in the Navajo

Rhodes, Page 3

FRUSTRATION VS. EMPATHY

The end is near. CAMPUS LIFE, p. 6



FULL CIRCLE

Ending the year the way it began. CAMPUS LIFE, p. 6

SWAGER GROUP

Researching a novel method for sensing pathogens. SCIENCE, p. 8

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Hilton: it 'has become clear' that MIT needs 'more time'

Housing, from Page 1

ance the distribution of residents across the houses," Hilton wrote.

Hilton wrote that it "has become clear" that MIT needs "more time to take [student]

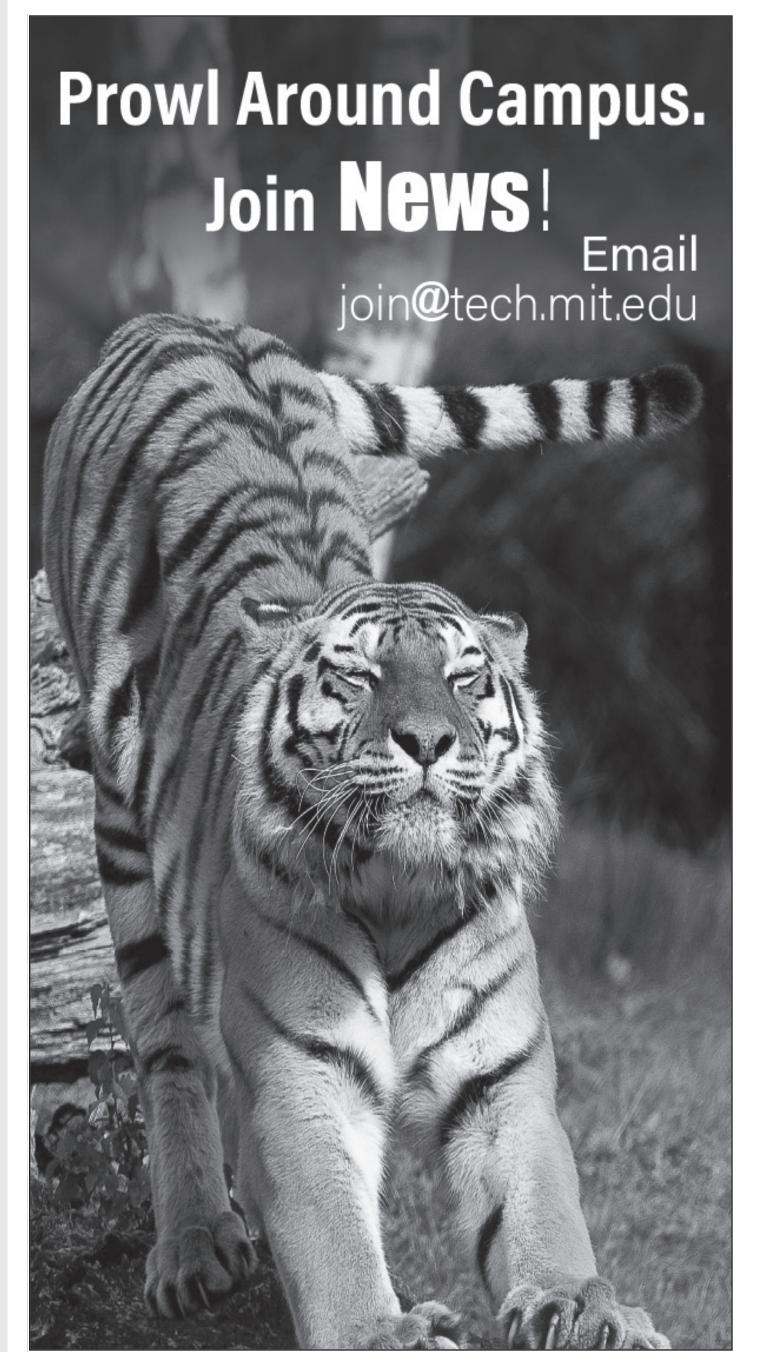
preferences into account and to get a better sense of demand for campus housing" before determining building placements. He added that housing assignments should "prioritize" student "health and safety" while also "setting students up to have as

positive a residential experience as possible during this unprecedented time."

The previous timeline for Spring housing included a building switch lottery period where students could request a different housing assignment. Hilton did

not indicate whether this lottery would be offered in the delayed timeline.

Students can visit the HRS Spring 2021 Housing Dashboard for updates or email questions to ughousingspring2021@mit.



THURSDAY, DECEMBER 3, 2020 THE TECH 3

WEATHER

Cloudy days and stormy nights

By Shinjini Ghosh and Phoebe Lin

After a mostly rainy and cloudy week in Cambridge, we are set to expect more rain on Saturday and another cloudy week ahead. After a relatively warmer end of November, temperatures are expected to dip over the first couple weeks of December, with lows of the day consistently being below freezing in the upcoming week, accompanied by gusty

For the rest of the country, after last week's wild storm, get hyped for another one coming up this

Extended Forecast

Today: Mostly sunny. High around 50°F (10°C). Northwest winds with a high of 14 mph.

Tonight: Mostly cloudy. Low around 37°F (3°C). Winds reaching

Tomorrow: Mostly cloudy. High around 53°F (12°C) and low around 41°F (5°C). Winds 9 to 11 mph.

Saturday: Rainy. High around 44°F (7°C) and low of freezing. Winds in the north up to 16 mph.

Sunday: Partly cloudy. High around 38°F (3°C) and low around

week! This storm will bring heavy snow, rain, and wind to much of the East Coast, from Georgia to New England. As always, California continues to bring us mild cloudy days, perfect for psetting while staring out the window with hot chocolate. Situation for Noon Eastern Time, Thursday, December 3, 2020 Weather Systems Weather Fronts Precipitation Symbols Other Symbols Fog Thund * ** § Hurricane 26°F (-3°C). Breezy with winds up to 21 mph.

Grey-Stewart encourages all MIT students to 'explore new fields through their electives'

Rhodes, from Page 1

Nation through the Priscilla King Gray Public Service Center.

Grey-Stewart will pursue an MPhil in nature, society, and environmental governance at Oxford. In an email to The Tech, Grey-Stewart wrote that her research interests "are still pretty broad, spanning from electronic characterization of nanomaterials to science policy as a whole." She wrote that her interest in materials science "stemmed from [her] classes and research experiences" while her interest in policy comes from her experience "working in the PKG Center" and her "desire to understand how I can use my

background in engineering in public service."

Grey-Stewart encourages all MIT students to "explore new fields through their electives. There are a lot of awesome classes here; I wish I had taken more time to really look through the options outside of my major and HASS concentration."

Ghadah Alshalan:

Ghadah Alshalan is a senior majoring in Course 8 with a minor in Course 6. Alshalan is currently "developing computational models relevant to quantum nanoelectronics" with Professor Pablo Jarillo-Herrero in the department of physics, according to MIT News. In the past, she has conducted research at the Research Laboratory of Electronics, the MIT-Harvard Center for Ultracold Atoms, and the University of Hamburg Center for Quantum Technologies in Germany.

Alshalan has been a teaching assistant for the physics department. In high school, Alshalan was Saudi Arabia's first female medalist at the International Physics Olympiad.

Alshalan has also served as president of the MIT Arab Student Organization and participated in committees for the MIT Muslim Student Association and the MIT Arab Conference.

Alshalan will pursue a master's research program in condensed matter physics at Oxford.

Alshalan did not respond to *The* Tech's request for comment.

Solution to Three

from page 4

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Solution to More

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Solution to Weeks!

from page 5

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Solution to Over

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Do you have a question President Reif?

Join The Tech's news department! join@tech.mit.edu



Three

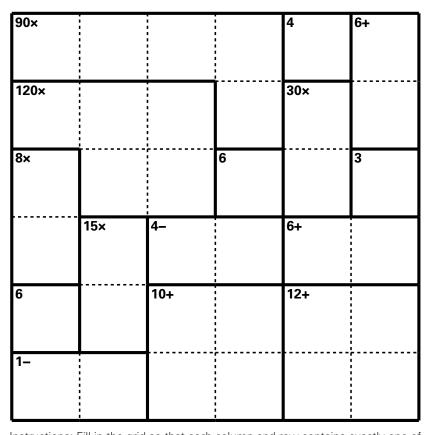
Solution, page 3

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Instructions: Fill in the grid so that each column, row, and 3 by 3 grid contains exactly one of each of the digits 1 through 9.

More

Solution, page 3



Instructions: Fill in the grid so that each column and row contains exactly one of each of the numbers 1–6. Follow the mathematical operations for each box.

Over Your Head by Brad Wilber Solution, page 3

ACROSS

- 1 When trains are due in: Abbr.
- 5 "Scat!"
- 9 Curved part of the foot 13 Become drained of color
- 14 Kangaroo's pocket
- 15 Hawaiian feast
- 16 "__ hardly wait!"
- 17 Regulations 18 Grow weary
- 19 Star groups like the Big Dipper
- 22 Have a meal
- 23 Signal "yes" with your head
- 24 Super Bowl org.
- 27 Interoffice note
- 30 Nuisances
- 34 Tax-deferred nest egg, for short
- 35 Coin in France
- 37 Per item, informally
- 38 Jets carrying many people 43 Cross paths
- 44 Fly high
- 45 Space between teeth
- 46 Standing up straight

- 48 Food for pigs
- 50 Where to observe the three longest answers
- 51 Beanie or beret
- 53 Large-scale conflict
- 55 Flying vehicles with people in baskets
- 63 Disappear gradually
- 64 Opposite of "everybody"
- 65 Very slightly
- 66 __ vera (burn-soothing plant)
- 67 Photocopier powder
- 68 Ready to take out of the oven
- 69 College housing
- 70 Gush like a volcano 71 Flow in slowly
- **DOWN**
- 1 Larger-than-life story
- 2 Filled-and-folded tortilla 3 Actor Alda
- 4 Taste, sight or hearing
- 5 Nary a __ (opposite of "everybody")
- 6 Ship's framework

- 7 Atlantic or Pacific
- 8 "Enough of your silliness!"
- 10 Damage beyond repair
- 12 Variety of a color
- 14 11- or 12-year-old
- 20 Cap of Scotland
- 21 As perfect as possible
- painting

- 29 Black-and-white cookies
- 31 Resort with whirlpools and saunas
- 32 Ice cube-grabbing tool
- 33 Say something
- 36 Of the mouth
- 39 Take a glance at
- 40 __-Sketch (kid's drawing toy)
- 41 Sneaking burglar
- 42 Secret agent
- 47 Tarnishes, as a reputation

- 9 Woman's choir voice
- 11 Coupes and convertibles

- 24 Slight chill in the air
- 25 Wooden holder of a
- 26 Sci-fi "beam" weapon
- 28 Beer steins

- 49 Buddy
- 52 Group of Boy Scouts



67

70

17

22

- 54 Boulevards and avenues
- 55 Angelic light
- 56 Aroma

16

- 57 Be abundant (with)
- 58 Elongated dog-biscuit shape
- 59 All over again
- 60 Woodwind instrument 61 Highest digit for phone

68

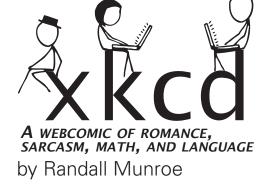
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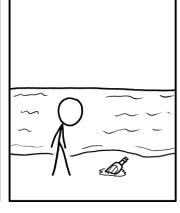
21

- numbers 62 Place for your feet on an
- escalator 63 Short-lived craze

[1675] Unsubscribe











Weeks!

Solution, page 3

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Instructions: Fill in the grid so that each column and row contains exactly one of each of the numbers 1–9. Follow the mathematical operations for each box.

Imagination vs. Reality of Thanksgiving break 2020

by Tianyuan "Margaret" Zheng '23

Who I thought I'd be this Thanksgiving break



Who I actually was this Thanksgiving break



Where the sidewalk ends...

...where the journey begins

By Wenbo Wu

I'd like to think that I'm an optimist with everything that's been going on in the world, and I'd like to think that despite the many hurdles 2020 has thrown at us, we will make it through stronger in the end.

But the reality is, no matter how much perseverance one throws at a generally terrible year, perseverance alone cannot suffice. As cliché as it may sound, it's ultimately about the people who have journeyed with us along the way, and I am indescribably thankful for them, you included, of course.

I'd like to mention that this will be the last iteration of ν for this year, and it's definitely not concluding in the manner I expected this column to when I first started composing these in February.

You see, I was anticipating a jolly endof-year celebratory walk, perhaps getting to venture further down Mass. Ave. toward downtown or Park Street, rather than, you know, getting stuck in Virginia for half a year and then ending back up in Boston. Clearly, that did not happen, and with the sharp uptick in COVID-19 cases as of late, that is even less likely now.

Although the column will not leave the year with a bang of a walk, I nonetheless had a blast.

I thought that this column was going to be purely train-of-thought, that the thoughts racing through my head would be so diverse and interesting that upon viewing different sights I would have such magnificent revelations that I would be able to fill up articles upon articles of content.

I mean, if you were thinking I was going to negate that last statement based on the serious tone of the previous paragraphs... I'm not. I *have* filled up articles upon articles with content. One thing my column does well, or poorly, depending how you view it, is its sharp tonal shifts.

But you ask, squinting with disbelief, "Have your revelations actually been that magnificent, though?" To that, I return the squint and mutter achingly beneath my breath, "Um. Heck yes." "Overconfident?" "Um. Heck yes." "Being sarcastic?" "Um. Heck yes."

In the spirit of my column though, I figured that I should at least take *some* sort of a walk for this end-of-year column. This column started the year with a hike down Mass. Ave. to witness the glory of an egg. And hence, I must seal the loop.

A cracked egg seeps from its shell, delightfully cheap from Target. I stand there wistfully as it sizzles away...

on the pavement on a sunny day. Okay. Maybe the cracked egg wasn't exactly *sizzling*, since this *is* Boston, rather just... kin-

da pouring out over the street. That's fine. Whatever.

The point is, this egg came in a dozen, 12 beautiful eggs tucked safely within the confines of a carton. Sounds so good so far, right? Wrong. I was deceived, fooled into thinking that the beautiful dozen I had chosen was perfect.

As a matter of fact, the carton of eggs was not flawless. *Gasp*. About 11 of them were fine, perfectly ovoidal as they should be. However, there was one: one single egg that, to my horror upon turning it upside down, had a crack in it.

And this wasn't some surface-level scratch, nor was it a line mistaken for a crack. No, no, no. This was on the level of Humpty Dumpty *cracked*. I suddenly found myself on the sidewalk with this egg. I don't know why I was there, but I was.

I dropped it. Intentionally? Unintentionally? I do not know.

Upon leaving Mr. Dumpty behind and continuing on my walk to who-knows-where, however, I have an epiphany. A great and terrible feeling scathes and seethes within my chest. I want to regurgitate the past nine minutes of my life as though that would somehow reverse time, physically undo what I just committed.

I feel awful. I gave up on that egg so easily, simply because it did not conform to my expectations of what an egg should be. I gave up on it because it was "imperfect," only because I could not comprehend its beauty.

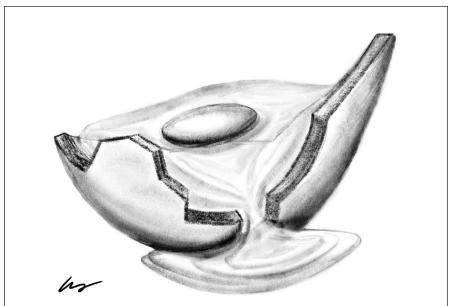
I bought the egg, after all. I bought it and took care of it as I carried the carton home from Target. The egg was mine. The egg was imperfect simply because I deemed it to be, because society created a concept of what a perfect egg should be.

But what about food safety? Fair point indeed. Such eggs are not to be consumed, regardless of how they're cooked. But I could've used this egg for something else, if only I had given it more care, more thought, more consideration! I could have used its shell at the very least to nourish a bed of chrysanthemums, carrots, or chives.

But I didn't. *I just gave up on it.* I tug anxiously at my hair as my feet switch onto autopilot. I find myself across the street by some miracle. At this point, I'm just avoiding people as they pass but otherwise completely out of it.

"It's just an egg, for chrissake. Get a hold of yourself!" you cry.

Sure, that makes sense in practice. A breeze blows past my face as a storefront flag flaps wildly in it. Am I crying? I can't tell; my face is numbed in frost. I sense my arrival outside Target again, but this time, instead of going inside, I turn around to go home.



WENBO WU — THE TECH

I pour out my emotions like an egg spilling out of its shell.

The problem is, as much as I try to dissociate myself from this egg, as much as I try to forget, I can't help but feel like a cracked egg sometimes. I will never be the perfect child my parents hoped that I would become, that my aunts and uncles and grand-parents wanted me to be. I had passed the point of no return the instant I was born. I had failed before I tried.

And believe me, I've tried. I really have. But no matter what I did, I always knew deep down but refused to admit even to myself that it would never be enough to please everyone.

Be tougher! Get yourself some thicker

Others' hopes projected forth and seeped into my head. As their hopes entered my mind, my own were forced out through my eyes. I felt miserable. And by the time one May many years ago came, I was certain that acceptance was not an option but to myself. I felt given up on, like an egg cracked upon the road.

So I gave myself a second chance, an opportunity to reflect and search for what I was truly passionate about. I sat myself down and gave myself a pep talk. I gave myself an opportunity to accept myself. From that point on, I would set my sights upon the goals that I had, what I wanted in life and what would make me happy.

Of course, I am still a ways from my dreams. Of course, not every step along the way has exactly been sunshine and rainbows. And, of course, I still carry a bit of my parents and other relatives within me, but only to the extent that their expectations

will make me into what I believe to be the best version of myself that I can be.

I banished the thoughts that had consumed me from within for over a decade. The truth is, it was a lot easier said than done, but the other side is a whole lot brighter. The truth is, I only learned how beautiful it is to love other people and the world when I wasn't so caught up in despising myself.

I'm still not completely in the clear yet, but I am almost there, all thanks to those I've opened up to and those who continue to support me. I love you.

I turn the corner back to my street, where the egg remains lay still. A couple of birds were huddled around it now, feeding upon the yolk as a pile of shell fragments rested in the grass nearby. *Huh. The birds must've moved them... or something.*

Looks like nature gave the egg a second chance after all.

And today, a month later, I must tell you that as I walk past the former spot of the fragmented egg shells, a clover and dandelion now call that spot home. Passerbys may overlook them, but to me, they are the most beautiful things to ever sprout. I hope they live long and fruitfully, and I hope the egg inside them helps them discover their purpose in life.

With that, I shall conclude *Wenbo's Walks* for the remainder of 2020. Have a happy holiday season, and I hope that you and your loved ones stay safe and healthy over New Year's Day. I will see you again in 2021. What shall the item of my infatuation be next year? Tune in to find out!

ME VS. ME

Frustration and empathy are conflicting

If I have to read the words 'in these trying times' one more time, I swear I'll vomit

By Joanna Lin

LDITOI

One emotion I was not expecting during this pandemic was frustration. Anger, sadness, loneliness, yes, but not frustration. It seems pointless to be frustrated with anything when the stakes are so clearly life-and-death. But here we are, the last issue of the semester, and I have felt nothing but frustration for the past 60 hours. At the same time, extending empathy to those who are struggling used to be something I defaulted to and something I championed to others.

Someone flaked on a meeting? Maybe consider something terrible came up and they didn't have time to let you know. Someone didn't really pitch in on a group project? Maybe they're having a really hard time right now. There's always an explanation if you're willing to look for it. But I'm at a balance point.

One source of my aggravation is definitely the MIT administration. When Housing and Residential Services pushed back dorm assignments four days and then five more weeks, how were undergraduates supposed to feel? Grateful that they were finally realizing that three thousand students could not possibly fit on campus safely? Or understanding of the fact that, after Sloan's master's students got their classes canceled twice, we were still the ones viewed as young and immature?

I don't blame them for having to make the hard decisions. I definitely don't envy them, either. There's no good solution, and no matter what they decide, there will be angry students, or worse, sick students. I just wish it wouldn't take so long to reach a decision. Because after all, they gave us three days to move out and less than two weeks to decide on a cohort with which to live for all of spring semester. Waiting for an announcement when you don't even know if it's coming is like waiting on Pi Day without knowing if MIT had even bothered to respond to your application. But then

again, MIT has a reputation of sticking to its plans, which is why each decision has to be deliberated for so long.

Another source of frustration comes from the class that I TA this semester. I started this semester so confident that I could be understanding of students' situations and do anything I could to help them succeed. What I didn't realize is that sometimes trying your best isn't anywhere close to enough. Particularly when I read regrade requests that accuse us of not reading answers or being too harsh, or nitpick our responses to invalidate a job 95% well done. But I can't be frustrated with the students who seem to hate me, because I know exactly what it's like taking classes online in my childhood bedroom, and it sucks. I learned this semester, as so many of my teachers have expressed to me in the past, I love teaching and I hate grading.

I've been feeling the same flip-flop with myself, too. With the last few days of the semester coming up and innumerable tasks that I have yet to complete, I'm angry that I so easily turn towards social media when I should be working or fall asleep when I mean to pull an all-nighter. Even now, as I write this article two days late and at 4:30 a.m., I haven't finished what I wanted to finish before I go to sleep. We're told to be gentle with ourselves because of the pandemic, but it's so hard to feel empathy for a person I know could be doing so much better if only I tried harder. I know exactly the ways in which I let myself procrastinate, and yet I can't stop myself from doing so. The complete lack of willpower is infuriating, and I don't even know if it will come back once the pandemic is under control.

But is it necessarily bad to feel frustration? Should I always give everyone the benefit of the doubt? (I have been told no.) Being upset with a situation shouldn't prevent me from recognizing that it's difficult for everyone in any predicament. But finding the balance is definitely a work in progress.



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LAB SPOTLIGHT

Biosensing with fluorescent emulsions The Swager Group combines principles of organic chemistry and materials science

to produce innovative solutions for detecting foodborne pathogens

By Albert Liu

A deadly foodborne bacteria, *Listeria* is one of the leading causes of food poisoning deaths via its namesake disease, listeriosis, Able to live through high levels of stress, Listeria is one of the pathogens frequently screened for in foods. However, current methods for screening are costly and require at least one day to grow cultures, a timeline that is often impractical for public safety. With such limitations, a new method for detecting Listeria is needed, a problem that the Swager Group at MIT Chemistry has tackled using a combination of materials science and traditional biosensing.

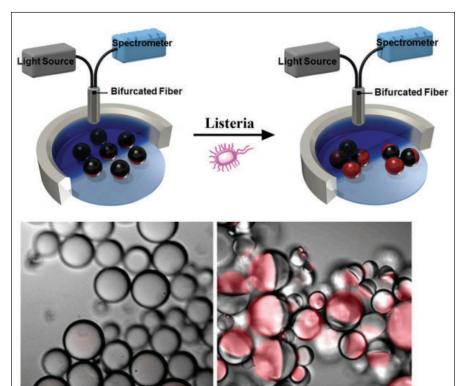
In order to detect pathogens, the Swager Group utilized a microparticle known as Janus droplets. Aptly named after the two-faced god in Roman mythology, Janus droplets are emulsions with two sides composed of different materials. Just as oil and water don't mix, Janus droplets are made of organic hydrocarbons on one side and fluorocarbons on the other, held together by careful adjustments of the surface tension of the liquids. The droplets are dispersed in water containing surfactants and naturally orient themselves by density. Fluorocarbons are similar in structure to hydrocarbons, except with many of the hydrogens replaced with the heavier fluorine, so the lower side of the droplets naturally consists of fluorocarbons.

For the actual biosensing aspect, researchers in the Swager lab coat one side of the droplets — the hydrocarbon face with antibodies specific to Listeria. To do so, they use a burgeoning field in chemistry known as "click chemistry," which involves functionalizing two chemicals with complementary groups and allowing them to react. In this case, the Janus droplets are modified with trans-cyclooctene (TCO) groups, which react efficiently with tetrazines added to the antibodies. Coated with antibodies, these Janus droplets are now

able to bind to *Listeria*. As multiple Janus droplets begin to surround and attach to the bacterium, a process known as agglutination, the droplets are dragged around. Since only one side of the droplet is covered by antibodies, this dragging motion causes the Janus particles to rotate, resulting in a detectable difference from above; previously only the hydrocarbon phase was visible, but the rotation exposes the fluorocarbon.

Innovative as this approach is, the technical details are challenging. In order to make the rotation of the droplets detectable, the group employs two dyes: a blocker dye to absorb incoming light and a fluorophore that absorbs and re-emits light. Kosuke Yoshinaga, a fifth-year graduate student in the Swager lab, focuses on developing the dyes for this project. He describes the two primary considerations for these dyes: their spectra (what wavelengths they absorb and emit at) and their solubility. "Very limited examples of dyes can be soluble in the fluorocarbon phase," Yoshinaga says. He adds, "You want to make something that you can manipulate with organic chemistry, but also maintain the fluorocarbon solubility, which is kind of contradictory because it's organic but kind of fluorous." In addition to solubility considerations, the two dyes must have compatible spectra; the blocking dye must not only block most incoming radiation but also absorb the emissions of the fluorophore in order to establish maximum contrast. Walking this tightrope, the group settled on subphthalocyanines for the blocking dye and a perylene bisimide for the emissive dye, which they amicably call the "Kosuke dye."

So how does this technique stack up compared to others? Jie Li, a third-year postdoctoral student in the lab, seems enthusiastic about its potential. Not only does it achieve a high level of sensitivity (100 CFU/mL), but this technique covers its predecessors' weaknesses. As Li explains, "I think our advantage in comparison with



The double-sided Janus droplets play a significant role in the Swager lab's work detecting *Listeria* more efficiently.

other detection methods of Listeria is that our whole setup is very cheap, and our detection is quick." Each sample requires only 10-20 microliters of solvent for screening, making the setup significantly more cost-friendly and scalable; meanwhile, the speed and ease of detection also is greatly improved, requiring only two hours and a one-step mixing for detection.

Despite the progress, both Yoshinaga and Li are excited for the further improvements that can be made. For the dyes, Yoshinaga is still searching for more emissive structures to enhance the detection limits. In addition, they're looking for ways to increase the stability of the droplets, such as by converting the system into solid form, which could increase the shelf life to years. Moreover, while the published work on this Janus detection system was for Listeria, this method is hardly limited to Listeria. By switching out the antibody from one to another, this system can be applied to practically any pathogen, whether bacterial or viral. With such a versatile and novel system, it's easy to sense the potential the Swager Group has in biosensing.

The Swager Group's work on the biosensing of Listeria can be found in their paper published in *PNAS*.

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