Volume 140, Number 46

SAT: 36°F | 21°F Mostly Sunny.

Thursday, February 4, 2021



A circle of chairs sit in freshly fallen snow outside Building 24

US lawyer Bryan Stevenson to speak at 2021 Commencement Stevenson argued landmark Supreme Court cases

By Wenbo Wu

Bryan Stevenson, founder of the Equal Justice Initiative (EJI) in Montgomery, Alabama and American lawyer renowned for his work in combating bias in the U.S. criminal justice system against the poor and people of color, will be MIT's Class of 2021 Commencement speaker June 4.

Stevenson has argued and won multiple landmark cases in the U.S. Supreme Court, including Miller v. Alabama (2012), which broadened the Supreme Court's ruling in Roper v. Simmons (2005) to deem mandatory life-without-parole sentencing of children 17 and under

Stevenson also successfully argued in the 2019 Supreme Court case Madison v. Alabama that the Eighth Amendment prohibits execution of a prisoner who cannot rationalize the reasons for their execution, whether it be due to psychosis or dementia.

Additionally, Stevenson and his staff "have won reversals, relief, or release from prison for over 135 wrongly condemned prisoners on death row and won relief for hundreds of others wrongly convicted or unfairly sentenced," the EJI webpage on Stevenson writes.

"As we face a future filled with uncertainty, now is the time for a renewed commitment to the idea that our own humanity depends on the humanity of everyone," Stevenson told MIT News. "I look forward to speaking to the Class of 2021 as they prepare to share with the world their own signature blends of the innovation, creativity, and compassion that are celebrated at MIT."

Stevenson earned his B.A. from Eastern University in 1981 and subsequently earned a master's in public policy from the Harvard Kennedy School of Government and a J.D. from the Harvard School of Law in 1985.

"As a trailblazer at the intersection of racial reckoning and criminal justice reform, Stevenson is one of the most compelling and relevant choices for commencement

Commencement, Page 2

IN SHORT

Undergraduates to campus should register to receive pre-departure CO-VID-19 testing kits.

Spring term registration week begins on Feb. 8 and ends on Feb. 12.

MIT affiliates should complete the COVID-19 Vaccine Eligibility Form.

The I am a LEADer Conference runs from Feb. 1 to Feb. 12.

February is Black History

Interested in **joining** *The Tech*? Email join@tech.mit.edu.

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

Institute Divest faculty survey results shared 54% of faculty respondents believe MIT

should divest from fossil fuel companies

By Kristina Chen

MIT Divest distributed an anonymous survey to faculty members on the Institute's use of its endowment in the fossil fuel industry. MIT Divest press coordinator Nicole Cybul shared the results of the survey in an email to The Tech.

The survey was sent to approximately 1,620 faculty members via email between October 2020 and January 2021, with the majority of faculty receiving the email in January. 285 faculty responded to the

survey, for an estimated response

The survey asked faculty for their department number and whether they had an opinion about MIT divesting from fossil fuel companies in its endowment. If they answered that they had an opinion, they were asked whether MIT should divest from fossil fuel companies (yes or no) and to optionally share a reason informing their stance.

30 respondents (10.5%) indicated that they had no opinion "about di-

Survey, Page 2



In the frigid weather, a frozen cup of coffee lies abandoned.

Lander, Zuber selected for science positions in Biden's admin

Eric Lander: Honored to have the chance to serve at a 'consequential moment for science and technology'

By Daisy Wang STAFF REPORTER

ria Zuber for ton science positions in

U.S. President Joe Biden selected Broad Institute Director Eric Lander and Vice President for Research Ma-

his administration. Lander has been named both Presidential Science Advisor — a position Biden intends to elevate to Cabinet member for the first time in history — and director of the Office of Science and Technology Policy, which requires Senate confirmation. Zuber has been named co-chair of the President's Council of Advisors on Science and Technology (PCAST), along with Caltech chemical engineer and 2018 Nobel Prize in Chemistry winner, Frances Arnold.

Lander will take a leave of absence from MIT. Todd Golub is the new director of the Broad Institute, where he served previously as chief scientific officer. Meanwhile, Zuber will continue to serve as the Institute's vice president for research.

Eric Lander

Lander has an extensive background in the sciences. After earning a B A in math from Princeton University in 1978 and a doctorate in math from Oxford University in 1981 through the Rhodes Scholarship, he taught courses on managerial economics, bargaining, and decision analysis at Harvard Business

Lander started learning about molecular biology and genetics in 1983, after his younger brother suggested that he might be interested in how biological systems process information. Shortly thereafter, he was appointed as a member of the Whitehead Institute and as a tenured professor in the department of biology at MIT in 1990. He was one of the principal leaders of the Human Genome Project from 1990 to 2003, and founded the Broad Insti-

Lander is not new to the U.S. government, having served under President Barack Obama as co-chair of PCAST, informing federal policy on science and technology from 2009

Lander was interviewed in MIT News, where he said that he is "deeply honored to have been asked to serve" during this "consequential moment with respect to science and technology." He said in a Broad press release that the U.S. is at its most important tipping point for science "since World War II."

Lander is especially well-known among undergraduate students for teaching 7.012 (Introduction to

Jake Yasonik '24, a first year who took 7.012 with Lander in Fall 2020, said in an interview with The Tech

that in class, Lander "always pointed out where the big research questions were and how to get involved, and so I got to see his forward-thinking, inclusive approach first-hand. I'm excited to have him leading the country's scientific initiatives

Yasonik also commented on Lander's ability as a science communicator: "not only does he know the science, but he created the science, and he uniquely knows how to tell its story to the government and the public," a skill that amidst the growing mistrust of science in the former administration will prove invaluable.

Maria Zuber

Zuber holds a B.A. in astronomy and geology from the University of Pennsylvania and a Sc.M. and Ph.D. in geophysics from Brown University. She was the first woman to lead a National Aeronautics and Space Administration (NASA) spacecraft

mission, serving as principal investigator of the agency's Gravity Recovery and Interior Laboratory mission - an initiative mapping the moon's gravitational field to answer fundamental questions about the moon's evolution and internal composition — in 2008.

Zuber has held leadership roles associated with scientific experiments or instrumentation on nine NASA missions since 1990. She has also served on the national Science Board since 2012, and more recently served as NSB chair from 2016 to

She is familiar with the realm of policy as she oversees more than a dozen MIT interdisciplinary research centers, including the Koch Institute for Integrative Cancer Research, the Plasma Science and Fusion Center, the Research

Administration, Page 2

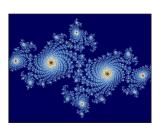
VASSAR GRADUATE DORM

The new dorm should include ground floor public and commercial space.

OPINION, p. 4

OUR SPACE ODYSSEY

The effect of astronomy on human culture. CAMPUS LIFE, p. 5



BLAND BROCCOLI

The fascinating features of fractals. SCIENCE, p. 7

CURSED THOUGHTS

Is love stored in the stomach? CAMPUS LIFE, p. 5

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Thursday, February 4, 2021

WEATHER

Surprise, it's still winter

By Sarah Weidman
STAFF METEOROLOGIST

If you're anything like me, you spent all of Monday evening watching the weather forecast and the skies, hoping that the mixed, slushy precipitation would turn into a foot of pristine snow. For those of us in the city of Boston, we were not so lucky. However, the most recent nor'easter left a snowy mark on many other parts of the country, leaving deep snow near Chicago, Philadelphia, New York City, and just to the west and

Although the bulk of the frozen precipitation missed Boston this time, February is still considered deep winter in New England. February is on average the second snowiest month (after January), and temperatures will only infrequently stray above 40 *F. For those of you in cold parts of the country, use this break before the spring semester to huddle beneath your blankets and drink some hot cocoa. For those of you in warm areas, take advantage of the outdoors before you (potentially) return to Boston's bitter winter next week!

Extended Forecast

north of Boston.

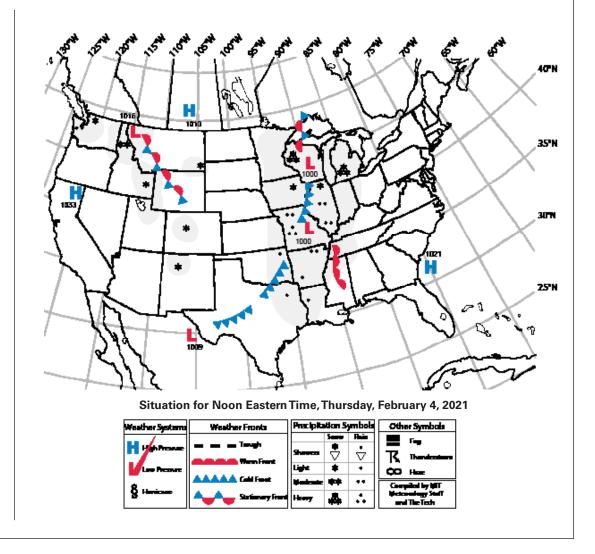
Today: Partly cloudy. High around 37°F (3°C). Northwest wind around 8-10 mph.

Tonight: Mostly clear. Low around 23 °F (-5 °C). West wind around 6-9 mph.

Tomorrow: Chance of snow, then rain. High around 41 °F (5 °C) and low around 31 °F (-1 °C). South wind around 5-10 mph with gusts up to 20 mph.

Saturday: Mostly sunny. High around 36 °F (2 °C) and low around 21 °F (-6 °C). West wind around 10-15 mph.

Sunday: Chance snow. High around 37 °F (3 °C). West winds around 8-13 mph.



Blake: Stevenson 'will provide a much needed perspective' on racial disparity

Commencement, from Page 1

speaker for this year," Undergraduate Association President Danielle Geathers '22 told MIT News.

As MIT "confront[s] our own role in perpetuating systemic racism, I expect Bryan Stevenson's words will inspire many at the Institute to dedicate their talents to fighting injustice," Geathers said.

MIT Class of 2021 President Kofi Blake '21 told MIT News that as the U.S. "continues to recognize and confront its systemic racial disparities, I believe Mr. Stevenson will provide a much needed perspective on tackling these issues." Madeleine Sutherland G, Graduate Student Council president, told MIT News that she was "excited to learn" that Stevenson would speak at Commencement "because graduate students expressed a desire to hear from someone who has faced oppression and made a real difference in the world." Sutherland

added that the MIT community "will learn a lot" from Stevenson's address.

Previous MIT commencement speakers include retired Navy fourstar admiral William McRaven (2020), politician and entrepreneur Michael Bloomberg (2019), Facebook COO Sheryl Sandberg (2018), Apple CEO Tim Cook (2017), and actor and director Matt Damon (2016).

The Class of 2020 Commencement was held through a live, virtual webcast. It has not yet been announced whether Commencement for the Class of 2021 will be in person or virtual

82.2% of 771 undergraduate respondents agree that MIT should divest

Survey, from Page 1

vestment from fossil fuel companies in the MIT endowment."

Of the 255 respondents who indicated that they did have an opinion, 154 (60.4% of those with an opinion, 54% of all respondents) responded that MIT should divest from fossil fuel companies. The other 101 respondents (39.6% of those with an opinion, 35.4% of all respondents) who had an opinion about divestment responded that MIT should not divest from fossil fuel companies.

Cybul wrote that the survey data gives MIT Divest "some insight into how much faculty support there is for divestment," which is useful for "talking with the MIT administration" about MIT Divest's requests and "using faculty support to [MIT

Divest's] advantage in pushing for divestment."

Those who responded that MIT should divest from fossil fuel companies named climate change as the primary reason. Many also wrote that MIT could demonstrate leadership and potentially influence other organizations by choosing to divest, with one respondent writing that "MIT should be a leader, not a follower."

"Fossil fuels are a primary cause of the climate crisis, and fossil fuel companies have spent decades denying or funding the denial of human-caused climate change," wrote one respondent.

Another wrote, "Set an example. Have our institutional actions match what we teach. Support the transition to renewables."

Survey respondents who answered that MIT should not divest

from fossil fuels wrote that fossil fuels will still be in use, regardless of MIT's actions, that MIT should work with fossil fuel companies to pursue more sustainable technologies, and that MIT should not be pressured into divesting.

One respondent wrote, "It's better to engage in shareholder activism to ensure the boards give commitments about continuing that alternative energy investment. If we divest we lose all ability to do that"

"MIT should make the most prudent investments in legal activities, and avoid being jerked around by the media and political pressure," another respondent wrote.

Respondents from both sides noted that divesting from fossil fuels was not necessarily a yes or no question, with one respondent writing "there is a continuum of concerns about fossil fuel companies. The question is posed as all or nothing. Those may not be our only options."

Another respondent wrote, "The decision to divest or not should not, and cannot, be so simple and binary. There are traditional fossil fuel companies ... who are making huge, company-wide shifts into renewable energies."

The Undergraduate Association Committee on Sustainability distributed a separate survey to undergraduates during Fall 2020 to "get a clearer idea of which sustainability-related issues" undergraduates "know and care about," according to the committee's sustainability survey data report. 934 undergraduates, approximately 21.5% of the undergraduate student body, responded to the survey

The survey included questions asking respondents to indicate their agreement with the statements "I care about MIT's relationship with fossil fuel companies," and "I believe MIT should commit to divestment from fossil fuels."

Of the 771 respondents who answered the two questions, 16% either strongly disagreed, somewhat disagreed, or neither agreed or disagreed with the first statement, that they cared about MIT's relationship with fossil fuel companies. 83.9% either somewhat or strongly agreed with this statement.

For the second statement, of the 771 respondents, 82.2% either somewhat or strongly agreed that "MIT should commit to divestment from fossil fuels." The other 17.8% of respondents responded either unsure, somewhat disagree, or strongly disagree.

Zuber: any solution must have crucial element of 'rebuilding trust in science'

Adminstration, from Page 1

Laboratory of Electronics, the Institute for Soldier Nanotechnologies, the MIT Energy Initiative, and the Haystack Observatory. She is also responsible for MIT's research in-

tegrity and compliance, and plays a central role in research relationships with the federal government.

Zuber echoed Lander's points in MIT News, stating that any solution must have the essential element of "rebuilding trust in science" and that she's "thrilled to have the opportunity to drive positive change" whilst working with President Biden.

Arnav Patel '21, a student who has worked with Zuber and her office through the Climate Action Advisory Committee as a representative of MIT Divest, said in an interview with *The Tech,* "It's good that another MIT voice will be helping bring science and fact-based policy back to the government."

He added that her appointment "means the work and actions that MIT take are going to be a lot

more scrutinized and highlighted given the connections to the new presidential administration." Patel hopes Zuber uses "her position to help drive more aggressive pro-climate policies here at MIT and there in D.C. than currently exist in both places."

DID YOUR MIT ESSAYS GET YOU IN?

The Tech is collecting successful application essays (**hint:** yours!). Email your pieces to cl@tech.mit.edu!

Thursday, February 4, 2021

Solution to To the Moon

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WANTED

sports·writ·er(s)

/ spôrts rīdərs/

noun: sports writers

journalists who write about sports.

No prior experience needed! Just an interest in sports. And probably writing.

For more information, please contact **sports@the-tech.mit.edu**

Capture the Moment



Join Photo at The Tech join@tech.mit.edu

We suggest the following possibilities:

student and community co-working area,

art/gallery space, and light food/bever-

age service such as a café and associated

of the zoning variance and special per-

mit process, and we are willing to commit

our support in that process if this request

is met. Let's work together to foster the

growth of this part of our shared neighbor-

hood as an active node, where residential

uses, business uses, and public ground-

With sincere regards,

The Cambridgeport

Neighborhood Association

Rachel Han, communications clerk

We express the above request as a uni-

fied voice of our neighborhood. We have

also heard many other concerns from our

neighbors, and in the spirit of representa-

Luke Mitchell, recording clerk

Rebecca Bowie, president

Cathie Zusy, treasurer

Brittany Butler

Julia Halprin

Gabe Cira

floor uses converge.

We acknowledge the arduous nature



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OPEN LETTER

MIT's proposal for a new graduate dorm on Vassar should include ground-floor public space

The Cambridgeport Neighborhood Association (CNA) submitted this letter to President Reif and the MIT Campus Planning team Dec. 7, 2020.

The proposed dormitory project, sited directly across the railroad tracks from Fort Washington Park, is being designed by Kieran Timberlake Architects and financed by American Campus Communities, a speculative private developer. Their soup-to-nuts agreement with MIT includes ownership of the building (but not the land it's to be built upon) and building operations for ten years, at which point ownership will be transferred to MIT. American Campus Communities will operate the building as a profit-motivated business during that time. The building's neighbors in Cambridgeport want to see it serve the broader community rather than solely the developer's bottom line.

Dear President Reif and members of the MIT Campus Planning team,

We are writing to you about MIT's proposed Vassar Street dormitory, slated for construction directly across the railway from Fort Washington Park in our Cambridgeport neighborhood. We are grateful that MIT is living up to its commitment to build more graduate student housing. However, we are expressing a concerted request on behalf of our neighborhood for the incorporation of ground-floor public space in the design.

Specifically, we request 25,000 rentable square footage (RSF) of ground-floor public and commercial space in the areas of the East and West buildings that directly abut the Central Plaza, as labeled on the schematic design plans and indicated in purple.

This is clearly the ideal and correct place to locate ground-level space.

A subsequent student master planning study of this immediate area, "CPORT + MIT: Envisioning the Future of MIT's Northwest Campus in Cambridgeport" (2016), also suggested that the region between the intersection of Erie Street and Waverly Street, and Fort Washington Park dubbed "The Hub" — be a node for public space, arts, and small commercial

Crucially, Zone SD-11 specifically notes the additional permitted use of "Retail, Business and Consumer Service Establishment" as 10% of gross floor area or 25,000 square feet, whichever is lower. Situated at a rail crossing, this site will soon be sandwiched between two active community paths: the separated facility on Vassar Street and the Grand Junction Multi-Use Path. With a multitude of pedestrian and mobility routes, direct adjacency to a Cityowned historic park, and hundreds of new residents, this is clearly the ideal and correct place to locate ground-level public and commercial space.

The site under consideration falls partially in Zone SD-6 and partially in Zone SD-11. Both of these Special Districts, along with nearby SD-5, SD-7, SD-8, SD-9, SD-10(F), and SD-10(H), were created in 1992 as the result of a resident-driven zoning petition and ensuing negotiations with MIT. The purpose of these actions was to create opportunities for more mixed-use and active-use development for this area. Following this, the 1995 Cambridgeport Neighborhood Study Design Recommendations sought to "encourage nodes of small commercial use in significant new developments. Developments in these nodes are encouraged to be of a character similar to street corner storefronts in the rest of the neighborhood."

public and commercial

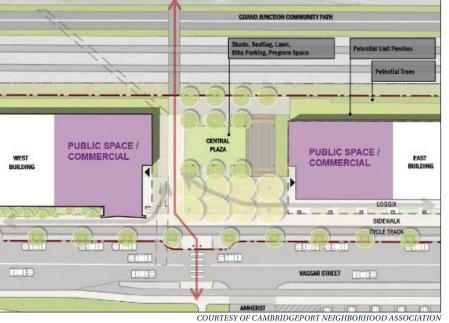
tion, we are including the most common • People with mobility impairments

and others in our community use the rail crossing at Fort Washington Park to access the CT2 bus stop. They are concerned with the closure during construction and would like a temporary rail crossing alternative during construction. · Neighbors are concerned with addi-

tional reflected rail noise after the dormitories are built. Adding a linear buffer of trees along the Cambridgeport side of the tracks, on MIT property (across from the site), would help reduce railway sounds. Planting the trees now would give them time to grow as new transit options for the rail corridor are developed. Many have expressed concerns that the

current project does not add open park space or recreation space, yet it adds 700 new residents. The constraints of the site and the proposed dormitory building are tight, so we ask that the issue of adding open park/play space be prioritized in future development in Cambridgeport, particularly the two MIT parcels at right and at left of Fort Washington Park. A public master planning effort for this area would allow us to envision together where these spaces might be located.

More information on the CNA can be found at its website. Members can be contacted at cambridgeportna@gmail.com.



The CNA requests that MIT include ground-floor public and commercial space in the areas of the East and West buildings shown in purple.

CORRECTIONS

A news article in last week's issue incorrectly stated that the full Spring grading policy was announced Jan. 21. In fact, the policy was announced Nov. 30. The Spring 2021 Emergency Academic Regulations and Recommendations were announced Jan. 21.

OPINION POLICY

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

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CLASS SPOTLIGHT

Life, the universe, and 12.400

Take 12.400 this spring for a beginner-friendly course on astronomy's relationship with humanity

by Jack Dinsmore EDITOR

In 135 B.C., a comet appeared in the twilit skies of Asia Minor, and in that unearthly light was born Mithridates the Great, future king of Pontus and one of Rome's most successful opponents. A second celestial interloper adorned the skies as he took the throne in 119 B.C., and in 44 B.C., a third comet reigned over Italy, mere weeks after Julius Caesar's death. According to legend, that is, and John T. Ramsey's historical analysis.

Pre-Renaissance humanity interpreted these comets as fantastic omens, prophesying Mithridates' successes and Caesar's deification. And while modern science knows them to be mere chunks of ice and rock, insignificant in comparison to their celestial companions and their regular orbits untouched by the hand of the divine, neither our minds nor our bodies have grown immune to the mysteries that nature has lying in wait for us.

Faced with the imminent threat of climate change, lives and livelihoods are at risk of drought, famine, and rising sea levels, and deadly diseases such as COVID-19 continue to shake the foundations of societies all over the Earth.

Yet our relationship with nature's mysteries is not entirely bleak. From the Copernican revolution to mastering travel by sea, rail, and plane, to space travel and landing on the Moon, humanity's path to its current state has been marked by triumphs of science. Triumphs which must guide our next steps as we inevitably discover life outside Earth, set foot on Mars, and venture into the unknown.

If the history of humanity's relationship with nature interests you, consider taking the newly designed 12.400 (Our Space Odyssey) this spring. The class is devoted to reflecting on the influence of astronomy on our species through time and cultures, our past challenges and successes, and what lies in store for us. It concludes with a final essay analyzing this topic, excerpts of which will be compiled and published professionally. Taught by Professors Julien de Wit and Richard Binzel, the class's only prerequisite is the Physics I GIR. Guest speakers from fields including anthropology, art, astronomy, biology, history, philosophy, politics, psychology, and theology will be invited to speak.

The future can sometimes seem bleak with a pandemic raging across the globe and with many of our lives now marked with grief. But reflection on the past accomplishments and focus on the future may help to alleviate the oppression of the present. And if that doesn't convince you, perhaps the thought of an extra twelve units will.

Thanks to Professor Julien de Wit for providing some of the language used above to describe 12.400.

This article is the first entry for a new column Class Spotlight, which will discuss and recommend interesting, yet not popularly known, classes at MIT. Students or professors who hope to submit further entries or classes for consideration to this column may email cl@tech.mit.edu.

CURSED THOUGHTS

My love: it aches

A uquiz, a throwaway comment, and an introduction to this column

by Ana Reyes Sánchez

EDITOR

CW: Nonspecific Mentions of Sexual

I have a playlist called Songs that make me feel That Thing on Spotify which consists of three songs:

- "From the Dining Table" by Harry Styles
- "Interlude: Set me free" by Agust D

• "peace" by Taylor Swift

I've gone back and forth about what "That Thing" means. It feels like the letters my dad wrote me after I left for college. It feels like the stillness that day I got the call that my friend was in the hospital. It feels like lying on a mattress with my friend stripped of the pillows, sheets, and topper - the night they asked us to leave MIT. There's birdsong in "Interlude: Set me free" that reminds me of the sunrise I saw on the Lyft ride to the airport.

For a long time, I thought that the feeling was "cursed." But it's not. It's an ache, originating in my stomach, that stretches so far sometimes that I feel it in my

My realization of this started with a uquiz and a throwaway comment. The quiz in question — Which private expression of love do you most represent? - was like any other. I got "Peeling a clementine."

Like so many other things, I sent it into my sorority Slack. The responses came in immediately:

- · A deep conversation in an unusual place
- and static over the phone
- · Silence and static over the phone,
- The familiar smell of your lover where their neck meets their shoulder

I was pleased; all of these expressions of love were nice. How lovely, I thought, that strangers can experience love so similarly. My friend started a thread in the slack after seeing their summary.

#uquiz

stomach aches.

scheming buddy • 5 days ago; 5:55AM ah heck this is a good one

Silence and static over the phone both of your eyes are closed. you both want to say it but neither of you are speaking. if you listen closely, and focus on their breathing, it's almost like they're there with you. when one of you finally breaks the silence with a whisper, they sound so close your

scheming buddy • 5 days ago reread it and not sure where tf stomach aching comes in but i will stand by my first reaction

ana:flag-mx: • 5 days ago does your stomach not ache with knowledge and being known???????

scheming buddy • 5 days ago no?? why stomach?? isn't the expression supposed to be heartache

ana:flag-mx: • 5 days ago
THE STOMACH IS WHERE THE LOVE IS ????? :laughing: 1

scheming buddy • 5 days ago that's so confusing do you just like,, feel extra loving when you drink spoiled milk or smth

ana:flag-mx: • 5 days ago OH MY GOD @scheming buddy where do you feel what aches?

scheming buddy • 5 days ago :concerned: why are you guys aching

ana :flag-mx: • 5 days ago @scheming buddy DOES NOT ACHE

 $scheming\ buddy \bullet 5\ days\ ago$ WOULD

mother • 5 days ago wait no okay fundamentally. do you not. is there not. something

This was the first time I had ever encountered someone not knowing exactly what I meant regarding love. Admittedly, this was also the first time I had ever really talked about the way that I experienced love. When I loved, it felt like I was gnawing right in my center. How else was I supposed to describe it if not as an ache?

PollyAPP • 8:42 AM is love stored in the stomach

You may vote for multiple options | 43% (3)

@black coffee, @jake from state farm, @ana:flag-mx:

2: no????? | 29% (2) @baby, @scheming buddy

3: stored in the stomach, hurts in the throat, i don't make the rules | 29% (2) @bon bon @mother

scheming buddy • 8:44 AM thank you @baby!!!! :heart: 1

ana :flag-mx: • 8:45 AM @baby HOW

baby • 8:45 AM ???? How could it be?? Stomach is for things that will be digested

ana :flag-mx: • 8:46 AM LOVE IS SOMETHING YOU EAT

 $mother \bullet 8{:}46\,AM$ it's about where the core of your being is bro okay so where is it stored

baby • 8:50 AM In the heart????

 $scheming\ buddy \bullet 8:51\ AM$ exactly!! the only acceptable answer

ana:flag-mx: • 8:51 AM
WHERE IS YOUR HEART IF NOT YOUR STOMACH :laughing: 1

baby • 8:51 AM Omg my heart is in my chest Idk what sort of messed up anatomy you have :evil_laughter: 1 :ear: 1

ana :flag-mx: • 8:52 AM wait wait wait @baby do you ache

baby • 8:53 AM Not currently no But sometimes??

ana :flag-mx: • 8:53 AM IS IT NOT PERPETUALLY IN THE BACKGROUND ?????

 $scheming\ buddy \bullet 8:53\ AM$ i think that would be heart disease or

ana :flag-mx: • 8:54 AM OH MY GOD

scheming buddy • 8:59 AM you guys are so dramatic

I turned to other group chats. Surely, I thought, there are more people who understand that love is an ache. I was sure that the way I saw love was universal. It was just lost in communication and eventually I would find the words to describe Jan 5 at 8:54 PM

hey hey

When you love, does it Does it ache?

only if the love feels incomplete?

oh my god

i would say

Other people did not experience love the same way I did. I felt the wind knocked out of me. Friends started chiming in with their own experiences of love:

Love was comfort. Love was healing. Love was mutual. Love was secure.

These were true, but they weren't exactly right. For me, love was the punchedout feeling in your stomach that never feels quite full.

ana:flag-mx: • 9:01 AM I ASKED OTHER PEOPLE AND IM @scheming buddy DOES YOUR LOVE FEEL COMPLETE?

scheming buddy • 9:01 AMyeah????

mother • 9:01 AM you guys are feeling complete???

scheming buddy • 9:02 AM dang feeling incomplete sounds like it would suck :pensive: sorry u guys are going through that

Most of my friends expressed worry, in one way or another, about the way that I talked about love. Some of them had experienced love's ache and disliked it. They brought up past experiences and explained that they would never want to be back there again.

I felt my stomach churn, and thought, what had love felt like before my sexual assault? My sophomore fall, I was terrified that something fundamental about me had been twisted:

God, I really thought I loved him. That's part of what hurts the most. How can I say that I loved someone that hurt me? Not only for the duration of our relationship, but who will haunt me for a long, long time. Are there still remnants of that love? Have I relearned what love is because of him? November 21st, 24th, 2019

Ache Page 6

Ache from Page 5

After talking with my friends, I scoured through more and more journal entries from before MIT. I read through pages and pages of journal entries and found, everywhere, staring back at me, that my love has always been an ache.

Time always did feel like it was winding down to an inevitable end

I wonder what it says that we await the taking

hollow ourselves out and give On Female Friendships October 21st, 2017

I was reassured to find that, even though I didn't use the word, I was describing the ache. Love had never felt complete in the way that people were describing it to me. I tried to explain it by comparing it to an endless pit. You're falling, but you can't feel anything to latch on to. You stop being able to tell how deep you've gone.

This wasn't quite right. My friend made another metaphor:

you know how the open ocean just keeps going till it hits the horizon but the horizon isn't actually a physical limit it's just the curvature of the earth? that.

And she was right.

Of course it aches. In the same way that thinking about the endlessness of the future does. Like the human brain cannot possibly understand how big and vast and full love is, and when it has nowhere else to go, it aches. All the way to your bones.

After this conversation, I felt it everywhere. I listened to that Spotify playlist on repeat for a couple days and understood that "That Thing" was love. I read love stories and felt it all the way to my toes. I laid my head down on my dad's hand at breakfast and felt the endless hollow in my chest. I wrote, and wrote, and wrote, and time stopped in the quiet that you feel rather than hear at 2 a.m.

It was on one of those nights this New Year's that I thought of the past. Specifical-

ly, I thought about how my high school self had ached so strongly, so proudly.

I read an article a couple of years ago that I still think about sometimes. The article is better as a whole, but you might recognize this iconic line that became a meme a while back:

"If we want the rewards of being loved we have to submit to the mortifying ordeal of being known."

Tim Kreider, "I Know What You Think of Me"

I've shied away from being known for a while now. I don't remember when it changed. This was my biggest New Year's goal.

Do you know me? Do you remember what it's like to love me? I don't know. It feels like you've lost yourself. Do you know what you're looking for yet?

I imagine you feel the same, you always do. Here is some advice for the next year:

- Be genuine. I know it can be uncomfortable for you to be known. But you, somewhere deep, know what you want. Don't be afraid of your goals.
- Be genuine with other people. You are loved, so much by so many. Allow yourself to feel that. Allow others to see it.

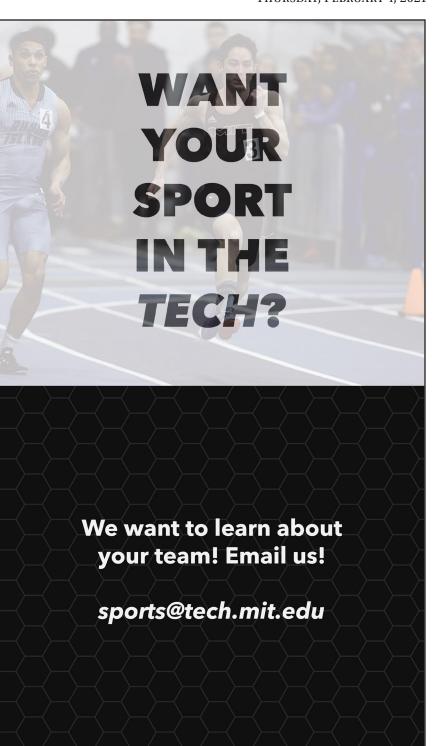
This isn't easy, I know that because I know you. But you want this. I know you do. I hope you are happy. I will work to make you happy.

I am your biggest fan and your first supporter. Go make the change you want. Querida Ana,

January 3rd, 2021

I texted my friend, "do you wanna hear a cursed thought?" and felt that ever-present ache. Such a simple question, such a complicated request — please, know me.

That's the real point of this article (thanks for sticking by me). I hope that whenever you read this column, you hear, do you wanna hear a cursed thought? and answer yes.



When you join Campus Life at *The Tech* and get to publish your secret diary



join@tech.mit.edu

SCIENCE IN YOUR LIFE

For the love of broccoli

Fractals are ubiquitous in nature and mathematics

By Robert Koirala

There is broccoli at MIT's dining halls almost every week. The broccoli is usually steamed or roasted. Although I miss the garlic, ginger, oil, onions, coriander seed, chili, methi, and masala that go well with broccoli, I enjoy eating it bland. I should instead say that I love staring at its details. When broccoli is cooked well with spices, either the details get destroyed or the spices obscure the details. On the other hand, with steamed, unseasoned broccoli, I can look at its hierarchy of stalks that are self-similar at all levels and detailed heads to the point that my food gets cold.

Whoever made the first broccoli must have tried to sculpt the details at an even smaller scale to show the existence of a fractal but failed to do so because of limited time. I feel good about the creator because they never had to worry about the uniqueness part of the solution. Nevertheless, they seemed to have tried hard to prove a fractal's existence in cauliflower, Queen Anne's lace, ferns, mountains, and coastlines to no avail. Well, a physicist could argue that broccoli is close enough to be a fractal: a stalk resembles the whole broccoli. A smaller stalk resembles a bigger stalk and so on. But for a mathematician, it does not have details smaller than the leaves that look like the whole broccoli. So, it does not qualify as a rigorous fractal.

"Fractal" must be a cousin of "fracture," as fractals are broken in some sense. Consider a fractal called a middle third Cantor set. Take an interval from 0 to 1 in the real number line. Delete the middle third of the line (excluding its endpoints). We should get two lines: one from 0 to 1/3 and the other from 2/3 to 1. With each of these lines, delete their middle third and continue the process forever. What is left after this iteration is the Cantor set. It is fractal because of its self-similarity at all levels. And it is constructed by breaking lines. However, not all fractals are broken.

Fractal could be a foe of "fair," since they are rough. Even the close-enough fractal, broccoli, is rough. If you have taken 18.100B (Real Analysis), you must know about the nowhere-differentiable function. For those who don't, when you zoom in enough on a differentiable function, say x squared at any point, you will start to see a straight line. But for a nowhere differentiable function, the function always has some roughness and a straight line never appears if you keep zooming in. In fact, the zoomed portion always has details that resemble the whole function. The complex details account for the roughness.

Fractal should be a mutant of "fraction," as fractals have "fractional" dimenlength. It is made up of 2^2 squares with sides of 1/2 length. On another note, it is also made up of 4^2 squares with sides of 1/4 length. Similarly, a cube whose sides are a unit length is made up of 2^3 cubes of sides of 1/2 length. Or we could also say it is made up of 4³ cubes with sides of 1/4 length. Note that the exponents in both cases carry the information of the dimension of objects.

Mathematically, suppose a set is composed of n sets that are a scaled down (by *r* units) version of the original set. Then the dimension of the set is $d = \ln(n) / \ln(r)$. Now consider the Cantor set. The essence of the construction of the Cantor set is in taking out the middle third of lines. Therefore, the points that we get after a deletion procedure starting with [0, 1] are similar to those starting with [0, 1/3] and [2/3, 1]. So, the new Cantor set consists of two copies of a scaled down (by three units) version of the original Cantor set. Therefore, its dimension has to be $ln(2) / ln(3) \approx 0.63$ which is definitely not an integer.

As of now, you might be thinking that fractals are akin to "fiction." They sound like mathematical fiction. After all, the examples in the real world that I gave are definitely not fractals because they are not infinitely broken and self-similar. Nor do they have fractional dimensions. Nevertheless, the creator of broccoli was successful

in creating other fractals in the real world. It took an MIT physicist, Ed Lorenz, and an MIT computer scientist, Ellen Fetter, to figure out that the equation that models the convection of atmosphere can have fractals. Further, fractals occur in chemical reactions (see Strogatz) and in population modeling (such as in the logistic map). Fractals are not fiction, so fractals must have an affair with "factual."

Actually, fractal has traits of "frenzy," as they usually appear in a chaotic environment. In the model that Ed Lorenz studied, fractals appear when the convection is chaotic. Even in a chemical reaction, the fractals appear in a chaotic reaction.

I am certain that fractal is a forebear of "fabulous." "Freakish" sounds closer to fractal, though. Regardless, fractals are so fantastic that I have fun staring at them.

They have a rich underlying mathematical beauty. The weird fractional dimension and self-similarity are only some aspects of it. One can do a whole lot of analysis on fractals. For instance, one can define a Laplacian on it. Recall that the standard Laplacian is used in modeling the heat equation. In a loose sense, it models the evolution of the temperature of a solid. The Laplacian involves two derivatives, and derivatives are defined on a smooth domain. But fractals as we have seen are not smooth. So, it takes some effort to define Laplacian (see Kigami). After we develop a Laplacian, we can model how the temperature of a hot fractal will evolve. One could also generalize the ideas like the uncertainty principle to fractals (see Dyatloy).

I get excited about all these things just by looking at the close-enough fractal, broccoli. More specifically, bland broccoli. Thus, I would like to thank the chefs at MIT's dining halls for not adding any spices to broccoli.

For beautiful pictures of fractals:

Barnsley, M. F. (1988) Fractals Everywhere (Academic Press, Orlando, FL). Feder, J. (1988) Fractals (Plenum, New

Mandelbrot, B. B. (1982) The Fractal Geometry of Nature (Freeman, San Francisco). Peitgen, H.-O., and Richter, P. H. (1986) The Beauty of Fractals (Springer, New York). Schroeder, M. (1991) Fractals, Chaos,

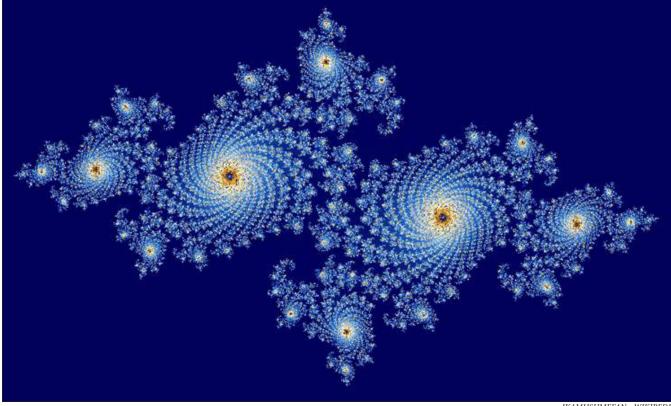
Power Laws (Freeman, New York). For advanced math:

Dyatlov, S. (2019) An Introduction to Fractal Uncertainty Principle. https://arxiv. org/abs/1903.02599

Kigami, J. (2001) Analysis on Fractals (Cambridge University Press, Cambridge,

Strogatz, S. H. (2015) Nonlinear Dynamics and Chaos with Applications to Physics, Biology, Chemistry, and Engineering (CRC Press, New York).

SCIENCE SCIENCE SCIENCE



IKAMUSUMEFAN—WIKIPEDI

sions. Take a square whose sides are a unit
The Julia set is a fractal studied in complex dynamics.



FUNFUNFUNFUNFUNFUNFUNFUNFUNFUN FUNFUNFUNFUNFUNFUNFU

To the Moon

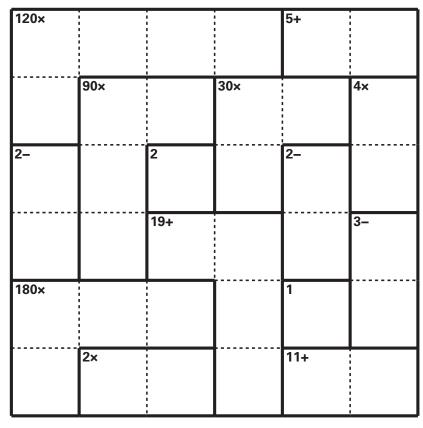
Solution, page 3

		3		9		7		
5			6	4	2		1	
					3			2
2					4	5		7
		8		7		3		
3 7		9	1					4
7			9					
	9		4	2	7			8
		2		5		4		

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.

Diamond Hands

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.

Trippable Trio by Jerry Clarkson

Solution, page 3

ACROSS

- 1 Elevator compartment
- 4 Decide to leave out
- 8 Blacken on a grill
- 12 Feeling achy or angry
- **13** Statistics
- **14** Real-estate listings
- **16** Broken concrete you might trip on
- **19** Military troop groups
- 20 What candles are made of 21 Hot beverage for Brits
- 22 Churchgoing group
- 23 Apple's tablet
- 25 Having no clutter
- **26** Otherwise 27 Nickname for Ireland
- 28 Real-estate listing
- 29 The whole alphabet
- 30 Become angry
- 31 Fruit skins you might trip
- 34 Never-happened-before events

by Randall Munroe

36 Enthusiasm

- **37** Sharp, as eyesight
- 38 Business titan
- 39 Touches on the shoulder
- 43 "Billionth" prefix for second
- 44 Young lads
- 45 Kitchen furniture
- **46** __ in a million (very rare)
- 47 Remark from a ram
- 48 Stick around
- **49** Sneaker strings you might trip on
- **53** Bottom-line invoice amount
- 54 Small city
- **55** Entice
- 56 Canvas shelter
- 57 Mailed away
- 58 Half a figure-eight

DOWN

- 1 Ranch's horse enclosure
- **2** One of the Musketeers
- 3 Say from memory
- 4 Praiseful poems
- 5 Angry 6 Part of TGIF

- 7 The Republic of China
- 8 Square-shaped cereal brand
- 9 "In what way?"
- 10 Athletes who aren't paid
- **11** Publicist's handout
- **12** Bottom-of-map info
- 15 Glided around on ice
- **17** Bottom-of-map info
- 18 Family man 23 Laundry appliance
- 24 Full of flair
- 25 Christmas season
- 27 When trains are expected: Abbr.
- 28 Achilles __ (weak spot)
- 29 Poker hand starter
- **30** Blacken on a grill
- 31 Person with dark hair
- 32 Concerning, in a memo
- **33** Pod vegetables
- 34 Search in a spreading
- fashion 35 Polite refusal
- **38** Seasides
- 39 "Hot" Mexican food
- 13 19 22 23 24 46 51 |52 53 55 57 58
- **40** Ancient adding machine

45 __ Aviv (Israeli city)

- 41 Toolbox gripper
- 42 Have a feeling
- 44 Not well done
- 47 Removable waistband
- 48 Apartment expense
- **50** Novelist Fleming
- 51 Weed-chopping tool
- 52 To each her _

[2270] Picking Bad Stocks

SHOULD KNOW ABOUT THE STOCK MARKET. WHAT IS INVESTING? DO YOU JUST OPEN A WEBSITE AND PICK THE COMPANIES YOU LIKE?

T FEEL LIKE BY NOW I



WELL, YOU TOTALLY CAN. BUT THERE'S A LOT OF EVIDENCE THAT NO INVESTING STRATEGY CONSISTENTLY PICKS STOCKS THAT OVERPERFORM THE AVERAGE OF THE WHOLE MARKET. A LOT OF FUND MANAGEMENT IS A MYTH.

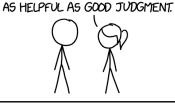


HUH, OKAY.

BUT THERE'S A WEIRD COROLLARY TO THAT IDEA: IT IMPLIES THAT, IGNORING FEES AND STUFF, IT'S JUST AS HARD TO CONSISTENTLY LOSE MONEY BY PICKING BAD STOCKS FROM AN INDEX.







I CAN DO THAT! NO, IT'S JUST AN EXAMPLE-THIS IS THE JOB I WAS

OH MY GOD.

BORN FOR.

500N..

HEY, THIS COMPANY'S CEO WANTS REVENGE ON THE SAME GHOST AS ME! I'M BUYING! OOH, AND THIS ONE IS PLANNING TO DEVELOP A "CAMPING ROOMBA." THAT'S A SURE BET!



DROP COMPANIES #208 AND #1434 FROM THE INDEX.



ment. Preorders have spiked, and..."

On the news a few days later: "Buzz is building around the so-called 'camping Roomba' after a big invest-