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Thursday, October 29, 2020



The dome atop Building 7 undergoes renovations.

Spring 2021 semester delayed, regular spring break canceled

Presentation by Chancellor Barnhart recommends inviting three undergraduate classes back to campus

By Kristina Chen and Kerri Lu NEWS EDITORS

Spring 2021 registration week will be from Feb. 8-12 while the first day of classes will be Feb. 16, according to the academic calendar on the registrar's website. Classes authorized to have in-person components will be remote until March 1. In addition, the usual week-long spring break has been replaced by three- and four-day weekends.

MIT still plans to invite first years, sophomores, and juniors to campus in the spring, according to a presentation by Chancellor Cynthia Barnhart PhD '88 at an Oct. 23 meeting. About 3,000 undergraduates and up to about 1,800 graduate students would live on campus in the spring under this plan.

The decision to delay the Spring start date by two weeks and to hold classes remotely for the first two weeks of the semester was made "based on consultation with public health experts," Chair of Faculty and the Academic Policy and Regulations Team (APART) Rick Danheiser

and Registrar Brian Canavan wrote in an email to the MIT community.

Danheiser and Canavan added that spring break was removed "to avoid the usual travel away from MIT." Six break days, consisting of two four-day weekends and two three-day weekends, have been designated instead. The calendar will have "the same number of break days as in fall semesters."

Barnhart's presentation writes that spring campus operations will

Spring Semester, Page 8

Andrea Ghez '87 awarded 2020 Nobel Prize in Physics for supermassive compact object

Ghez: being a woman in science is like being 'accused stupid until you prove you're smart,' which 'really pushes you to prove that you belong' in the field

By Shelley Choi

ASSOCIATE NEWS EDITOR

Astrophysicist Andrea Ghez '87 was awarded the 2020 Nobel Prize in Physics by the Royal Swedish Academy of Sciences Oct. 6. She received half of the prize jointly with Reinhard Genzel "for the discovery of a supermassive compact object at the centre of our galaxy." Ghez is currently the Lauren B. Leichtman and Arthur E. Levine Professor of physics and astronomy at the University of California, Los Angeles. She received a B.S. in physics at MIT, and is the 38th MIT alumnus to receive a Nobel Prize.

The Tech spoke with Ghez over the phone to discuss her winning of the Nobel Prize, research, and experiences as a MIT undergraduate student. This interview has been lightly edited for clarity and

The Tech: What does winning the Nobel Prize in Physics mean to

Andrea Ghez: Oh gosh, I'm just thrilled. I'm thrilled that the work was recognized at this level. It's a wonderful opportunity to highlight the kind of science that we're doing and the technology that enabled it. I guess I sort of see it as both a recognition and an opportunity.

TT: When were you initially interested in astrophysics and what fueled that interest?

Ghez: It's hard to identify the true start. I'd always been interested in the universe from a very early age, but I came to MIT actually wanting to be a math major. Formally, I switched my focus to astrophysics somewhere between my freshman and sophomore

I first got interested in astrophysics through the moon landing [which happened when I was four]. I got really captivated by imagination about the scale and size of the universe; when you start thinking about that you immediately come up against these concepts of boundaries and edges and infinity, which I think initially took me in the direction of math. Ultimately, I came back to a more pure approach to thinking about the universe directly rather than through math. MIT really developed that in a professional way, from a childish fascination to a much deeper understanding of what aspects of the universe I found compelling.

TT: In the realm of astrophysics, why did you choose to specifically research black holes?

Ghez: They are so simple yet hard to understand. They're where

Nobel Prize, Page 8

IN SHORT Election Day is Nov. 3.

To register for Spring classes, all MIT students must submit proof of receiving a flu shot by Oct. 30.

The last day to add half-term classes for H2 is Oct. 30.

Nominations for recent MIT graduates to the MIT Corporation are open until Oct. 30.

The deadline to nominate faculty members for the 2020 **School of Science Teaching** Prizes is Oct. 30.

Halloween is Oct. 31.

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

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



MIT students enjoy a nice day in marked, socially distanced circles on Kresge Saturday Oct. 24.

AI Policy Forum launched by SCC

Policy forum will bring together global stakeholders to 'provide a focal point for work to move from AI principles to practice'

By Nicole Chan

The Schwarzman College of ng AI Policy Forum starting this fall.

Provost Martin A. Schmidt PhD '88 and SCC Dean Dan Huttenlocher PhD '88 wrote in an Oct. 19 email to the MIT community that the forum "will engage a broad set of stakeholders with the goal of moving the global conversation on AI policy from principles to implementation."

The AI Policy Forum website writes that the forum will develop a policy framework building on "high-level principles on social and ethical issues such as privacy, fairness, bias, transparency, and accountability." Additionally, the forum aims to "have real impact in the world of AI policy, as measured by clear action from governments and

SCC Director of Communications Computing (SCC) has launched a Terri Park wrote in an email to The Tech that the forum will begin with "a series of preparatory task forces that will explore some of the most pressing issues of AI policy — mobility, finance, healthcare, climate change, and food supply." Moreover, the specific policy issues addressed will be "specific — or granular — enough, while also being relevant across countries, regions and cities."

Each task force will be "chaired by an MIT researcher" and include "a diverse range of technical and policy experts from around the world." Park wrote that "the charge of the task forces is to present a report at the end of the period which will feed into the development of the AI Policy Framework."

Park wrote that "these activities will culminate in the AI Policy Forum Summit, a two-day collaborative gathering (most likely taking place online) on May 6-7, 2021" to " the progress of the task forces." A fall 2021 "follow-on event" at MIT "will bring together leaders from across sectors and countries" to "provide a focal point for work to move from AI principles to AI practice."

Park wrote that the goal of the forum is to "develop frameworks and tools for governments and companies to implement policies in concrete ways." "This is the time to take the next step by building on those broader principles to help policymakers in making practical decisions about AI," she added.

MIT community members can send questions or comments to aipolicyforum@mit.edu.

COMPASSION FIRST

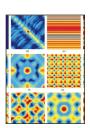
Science should not decide what is worthy and unworthy. OPINION, p. 4

SPEAK UP

How a generation of Nigerian youth mobilized against injustice. OPINION, p. 5

WRITING THE FUTURE

Capturing anti-establishment energy in all its glorious heterogeneity. ARTS, p. 6



TURING THE BIOLOGIST

Patterns and randomness in developmental biology. SCIENCE, p. 7

ALUMNA OLYMPIAN

Cycling from Cambridge to Tokyo 2021. SPORTS, p. 12

SECTIONS

oumput End
Opinion 4
Arts 6
Science7
Fun Pages 10
Sports

2 The Tech
Thursday, October 29, 2020

WEATHER

Boston cooling as Election Day looms near

By Francesca Macchiavello

This week in Boston, we can expect a couple of consecutive days of grey skies and gloomy conditions. With rain and low temperatures coming up, fret not, the sun will come back out to play on Saturday, so make sure you spend some time outside and soak up those UV rays. On Sunday, the rain is likely to come back, but with slightly higher temperatures. As the weather starts to get cooler by the day, predictions for when the first snow in Boston are ramping up, so make sure to

check out the National Weather Services predictions and join some friendly neighborhood betting circles.

Elsewhere in the U.S., there will be a variety of experiences. In the southwest, it will be much warmer than Boston and there will be plenty of sunshine. For those in Louisiana, do your best to stay safe as Hurricane Zeta runs its course. Make sure you're prepared for what's happening where you live whether that is a jacket or shorts. You wouldn't want to be reading the forecast for another city!

Extended Forecast

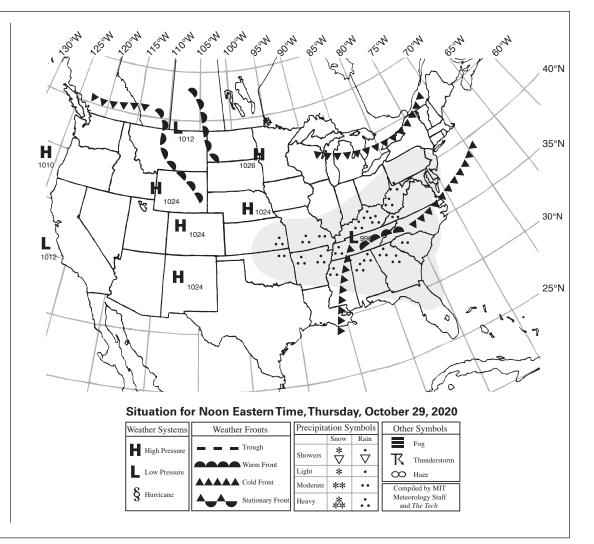
Today: Rain, mainly after 2pm. High near 50 °F (10 °C). Light and variable wind becoming east 5 to 7 mph in the afternoon.

Tonight: Rain before 8pm, then showers after 8pm. Low around 38 °F (3 °C).

Tomorrow: Showers likely, mainly before 10am. Mostly cloudy, with a high near 42 °F (6 °C). Breezy, with a north wind 17 to 23 mph. Low around 30 °F (-1 °C).

Saturday: Sunny, with a high near 44 °F (6 °C). Northwest wind 7 to 9 mph. Low around 34 °F (1 °F).

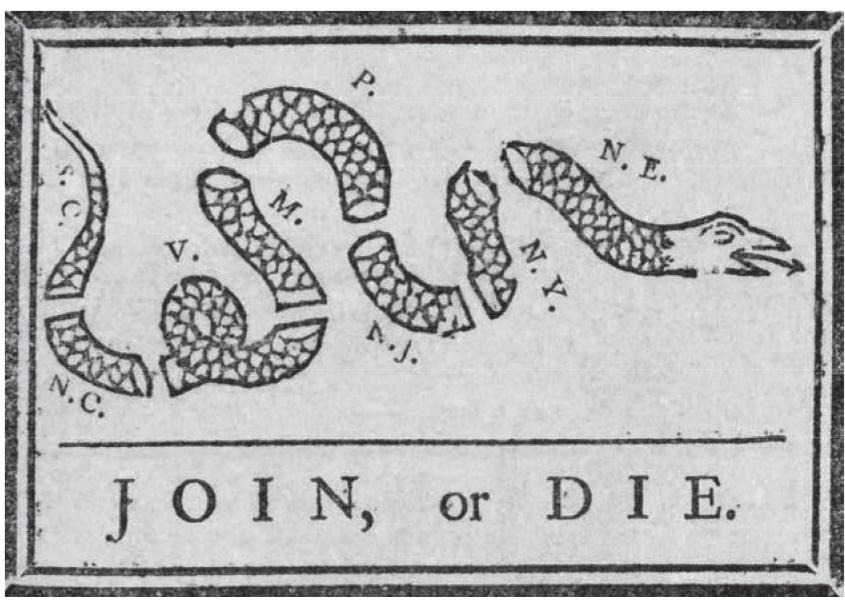
Sunday: A chance of showers after 9am. Partly sunny, with a high near 57 °F (13 °C). South wind 9 to 15 mph.



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join@tech.mit.edu



ME VS. ME

A ramble I am not quite qualified to ramble about

Too many thoughts and not enough sleep

By Joanna Lin EDITOR

I'll be honest: I didn't really know what to write about this week. I still have a lot of internal debates, but none seem more important than the election that's happening in only a handful of days. There's a feeling of impending doom that even if Biden wins, we are too far down this rabbit hole to ever emerge whole again, that the Democratic party is very nearly as bad as the Republican party, and neither represents anybody in our country.

The United Nations recognizes 195 sovereign states. Why are we even obsessed about being number one? It feels woven into the American mindset on a national and individual level that we should always win, and by miles, no less. Maybe it takes being a student at MIT to start understanding that getting by is equally commendable as being the best.

Speaking of "getting by," some of my classes have acknowledged the enormity of the coming week, while others haven't. Part of me wants to buy into the illusion that life can carry on as normal if I just bury myself in a pset. The other part of me just gets distracted too easily by the news and can't even finish one reading over an entire

While my peers and I have grown used to calling each other out for problematic words or actions, talking to those in a wider circle is a completely different experience. For example, nearly all the parents of my family friends are voting for Trump. And it would be "ungrateful to argue with them when they fed me and loved me when I was a child," as I've been told. At the very least, it would isolate my parents from their friends. Venturing further, it's clear that some teenagers are no more progressive than their parents and grandparents, with more and more videos surfacing of high school students slinging incredibly racist slurs.

Part of me wants to buy into the illusion that life can carry on as normal if I just bury myself in a pset.

Four years ago, I couldn't do anything but watch the television with a knot in my stomach. And now, voting in the overwhelmingly blue (but only in cities - a whole other discussion) California, it feels exactly the same as when I couldn't vote.

I can completely understand people who don't vote in states where it really doesn't matter. Even Among Us, a game with absolutely no consequences, uses the popular vote. Still, how could anyone not vote?

In my history class, we're discussing the interwar period. In some ways, our current experience is drastically different, like the immediate access to news and, as of yet, the undeclared war. But in other ways, the polarizing ideologies and inability to reach common ground are so similar

I'm not even sure I can feel more desolate about the state of U.S. politics than I already do.

One of my professors emphasized that we need to set aside time to process the results, whatever they may be. I'm not even sure I can feel more desolate about the state of U.S. politics, and the world, than I already do. Everything is disappointing, but nothing is shocking. And I'm not nearly educated enough on anything to be able to hold a full conversation about it, much less

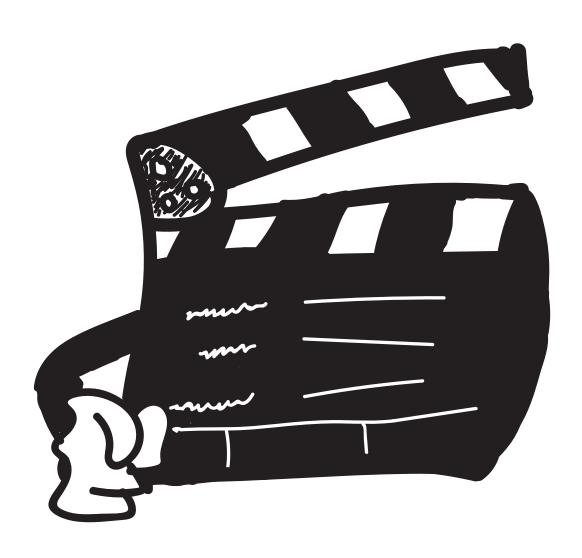
Instead, here's a short, noncomprehensive list of recent or current topics about which I've been thinking and into which I've been throwing my measly UROP money.

- Amy Coney Barrett's confirmation to the Supreme Court, just eight days before the election.
- The quickly dissipating support for #BlackLivesMatter as everyone returns
- · Azerbaijan and Turkish attacks on Armenians in Artsakh.
- #EndSARS protests in Nigeria against the Special Anti-Robbery Squad.
- Youth protests against the Thai Prime
- Floods and landslides in Vietnam.
- The beheading of a French teacher by an Islamic terrorist, and the French Minister of National Education's decision to blame it on intersectionalist theory from American universities.
- · Still-increasing COVID-19 case numbers, both in the U.S. and worldwide.

So, in conclusion, midterm season and election season have converged to a perfect storm. I am simultaneously no thoughts, head empty and many thoughts, head exploding, and I think I will be stuck this way for the next few weeks.

change someone's mind.





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GUEST COLUMN

Autism research from an Autistic perspective

Neurodivergents deserve better

By D. Catalá

I was diagnosed with Autism Spectrum Disorder at 18 years old. At 18 years old, I began to understand myself. Finally, I understood why I am this way. Why I can never stomach fish, why scented candles give me nausea, why eye contact is painful, why I don't shut up, why I keep repeating the same phrases over and over again, why I can smell the barbeque from three doors down, why jokes can go over my head, why I laugh when no one else does, why I've failed at femininity, why I've been a pretender, why I've stuck out, why I've been sensitive, why I've been taken advantage of, why I had to take a break from school. At 18 years old, my life was no longer a random series of episodes in pain and suffering, but a riddle, finally deciphered.

To attempt or to remove or "cure" my Autism, would be ego murder.

I believe that my Autism is a fundamental part of my existence and a fundamental part of my personality and perspective. My successes and strengths exist because of my Autism, not in spite of it. To attempt or to remove or "cure" my Autism, would be ego murder.

Why then is my life and those of others like and unlike me a playground for a debate of "ethics"? Why is the erasure of my experiences and those of future neurodivergents even a question? Why do I have to argue for my right to exist?

Despite my wishes or those of other Autistics, millions of dollars each year go to Autism genetics and neuroscience research. In 2016 (the most recent year I could find comprehensive data for), of \$364,435,254 spent in Autism research in the United States, 24% went to genetics and 35% went to biology. Despite studies indicating that Autistic people live shorter lives (some indicate a life expectancy as low as 36 years old), are more likely to commit suicide, and face a 58% young adult employment rate, only two percent of those millions went to "lifespan issues." ("Lifespan issues," of course, is a euphemism for anything that happens to Autistic people past the age of 18.) At the risk of sounding anti-intellectual, I do not care what causes Autism nor do I care what makes our brains so different. Generously, I will say that pure curiosity motivates most of these researchers, but what happens once we find "the cause" of Autism? It's not ludicrous to assume that in vitro fertilization clinics would quickly implement Autism-screenings, selecting only for zygotes least likely to be disabled and disposing of the rest. Startups will create prenatal tests to determine if your child could be anything like me, giving you a chance to terminate. This is already happening with Down syndrome. Science does not exist in a vacuum, and if it can be applied to make a profit (or to do evil) it will be!

Despite my wishes or those of other Autistics, millions of dollars each year go to Autism genetics and neuroscience research.

Defenders of these looming eugenicist practices claim they want to "minimize human suffering." But what suffering? The suffering I have experienced has been because of misunderstanding, rejection, judgement, isolation, and abuse. The suffering I have experienced has been because of how others perceive and treat me as an Autistic person.

My suffering is not intrinsic to my Autism. If what truly interested them was suffering and not conformity, they would be working to change the conditions that are currently causing suffering: poverty, racism, police violence, transphobia, incarceration, colonization, ostracization, ableism, etc. There are many systems that are actively doing harm that NEED to be dismantled to ensure the safety and well being of all people, so why are we working to annihilate neurodiversity?

My suffering is not intrinsic to my Autism.

Autism research and paradigms have shifted from finding a cure to early detection and intervention; even the notorious Autism Speaks has removed the word "cure" from its mission. But I am hesitant to applaud this as a victory, because these interventions may be another method of

enforcing conformity, leaving the ableist status quo unquestioned. Even children diagnosed early can suffer lasting trauma from Applied Behavior Analysis therapies and Special Education classes. Why are we working to annihilate neurodiversity?

Why are we working to annihilate neurodiversity?

Everyone deserves to live a full, dignified life. And by everyone, I mean everyone. Even those with high support needs, those with intellectual disabilities, those who exhibit emotional outbursts, those who are non-verbal, those who have been convicted of crimes, those who may pose danger to themselves, those who may pose dangers to others. We all deserve better than extinction. We deserve better than bleach drinks and enemas, we deserve better than inspiring an anti-vaccine/ anti-science movement, we deserve better than sedation via psychiatry. We deserve better than trauma, abuse, and extinction. We deserve better than a measly two percent in lifespan

Everyone deserves to live a full, dignified life. And by everyone, I mean everyone.

Ultimately, I hope that Autism research will shift to finding radical and innovative ways to support people with Autism and challenge the neurotypical hegemony. Beyond that, to paraphrase Mia Mingus, we need to dismantle systems that decide who is worthy and unworthy of being "typical," of having their needs met, or of even living; further, we need to build a world that values all bodies and minds as "unique and essential." I hope that all researchers can uphold these truths and consider the effects that their research will have in one, two, five, or more years. And that scientific curiosity always considers compassion first.

If you are interested in learning more about Autism from an Autistic perspective and supporting Autistic voices, visit the webpage for the Autism Self Advocacy Network.

D. Catalá is an undergraduate on medi-

OPINION POLICY

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GUEST COLUMN

The "Soro Soke" generation of Nigerians

What comes next for the Nigerian youth

By Awele Uwagwu

On Oct. 20, 2020, the Nigerian military opened fire at tens of civilians protesting at the Lekki toll gate in Lagos, Nigeria. This event, now termed by many as the "Lekki massacre," was preceded by almost two weeks of peaceful protests nationwide. The leaderless protests began organically against a special police unit in the country known as SARS (Special Anti-Robbery Squad). SARS has been notorious for years for its extortion of and brutal disregard for the lives of the citizens it was instituted to protect. SARS officers are known to arrest youth for owning nice phones, having tattoos, wearing their hair in dreadlocks, or even carrying a laptop bag. After these unlawful arrests, they then proceed to solicit large sums of money from the arrested or their families to guarantee

Those that are unable to pay their way out of SARS' hands often pay much graver consequences.

Those that are unable to pay their way out of SARS' hands often pay much graver consequences. A Mr. Godwin Sunday publicly shared how he lost his wife on Sept. 16, 2015. On his way home from church with his wife and four children, Mr. Sunday was held at gunpoint and asked for 2,000 Naira — roughly 5 U.S. dollars. After explaining that he had no money with him, he began to walk back to his vehicle when he heard two gunshots. His wife had been shot in the head, and the bullet meant for him had grazed his shoulder and caused permanent damage to his jaw. The officers in charge of this sinister crime were not prosecuted — this is the level

of impunity that has been permissible for so long in Nigeria.

The military opened fire on innocent Nigerians — they took the lives they are sworn by duty to protect.

This police brutality and impunity is what brought thousands of young Nigerians out to the streets for weeks to exercise their democratic right to protest. Within days, the Nigerian President announced the dissolution of the SARS unit. However, the unit had been previously dissolved in 2017, 2018, and 2019. This time, the youth refused to back down and demanded clear action to ensure that SARS officers will not remain on the streets. And to support their protests, in spite of the leaderless and organic nature of the protests, a very clear five-point agenda was produced and given to the government. Instead of swiftly acting to meet the people's needs, the government responded by unleashing state-sponsored thugs to instigate violence in an attempt to undermine the legitimacy of the protests. Such a tactless response to very clear demands showed that police impunity and brutality are symptomatic of a much larger problem: ineffective, corrupt and self-serving leadership in Nigeria that has consistently failed to serve the needs of the people.

The protests continued all around the nation and on Oct. 20, a curfew of 4 p.m. was announced in Lagos state — a city of 21 million people — at 11:30 a.m. Around 4 p.m., the cameras at the Lekki toll gate in Lagos were disconnected and as evening approached, the lights around the toll gate were switched off yet many of the protesters remained and peacefully continued to demand a better Nigeria starting with police

reform. Soon after, the military arrived at the toll gate and with thousands of Nigerians, along with the rest of the world, monitoring the situation through social media, what happened next was unbelievable. The military opened fire on innocent Nigerians — they took the lives they are sworn by duty to protect. Some protesters gallantly continued to sing the national anthem even as the bullets were fired.

Even in our sorrow, there is an undeniable truth that many of the youth that have taken to the streets during these protests whether it be the Nigerian streets or the Twitter streets incessantly tweeting with the hashtag #EndSARS — have woken up. The "Soro Soke" (a Yoruba phrase meaning "speak up") generation has had its moment of national reckoning. A generation often regarded as uninterested in matters of national interest has been mobilized under a united front to fight for the future of our country. Even without any clear leaders, everyone played their own part from bringing speakers for the protests, to setting up phone charging stations, to providing food and drink, to cleaning up after the protests.

This police brutality and impunity is what brought thousands of young Nigerians out to the streets for weeks to exercise their democratic right to protest.

One notable group at the forefront of planning is the Feminist Coalition — a group of Nigerian women with the goal of "championing the mandate of Nigerian women." Through their platform and with

the help of several other people and orga nizations, they were able to raise around \$390,000 to cover the costs associated with the protests such as legal expenses, medical care, and others. More impressively, they were able to account for every Naira spent - something the Nigerian government continues to find difficult. In a matter of days, we saw them set up helplines so that they could quickly attend to the needs of the protests nationwide. We saw over 700 lawyers volunteer their time and expertise to get arrested protesters in over 20 states released. With their tireless work, they were able to get at least 81 protesters released and still continue to fight for the release of

In a matter of days, these "lazy" Nigerian youth were able to unite and create, with seamless operation, a sustainable ecosystem to facilitate these protests. We have shown that we are capable and we have shown that we can lead. Robert F. Kennedy said: "This world demands the qualities of youth: not a time of life but a state of mind, a temper of the will, a quality of the imagination, a predominance of courage over timidity, of the appetite for adventure over the life of ease." We have displayed these qualities in abundance. It is imperative that we remember the lives lost during these protests, that we remember how our unity brought the world to attention and caused our government to panic in their attempts to save face. Most importantly, it is imperative that we remember what we can achieve together, fighting for ourselves and our country, while bearing in mind that change will always surrender itself to persistent suitors.

If you would like to support the #End-SARS movement, please continue to spread awareness on social media and through any platforms that you are able.

Awele Uwagwu is a member of the Class of 2021 studying Chemical Engineering.

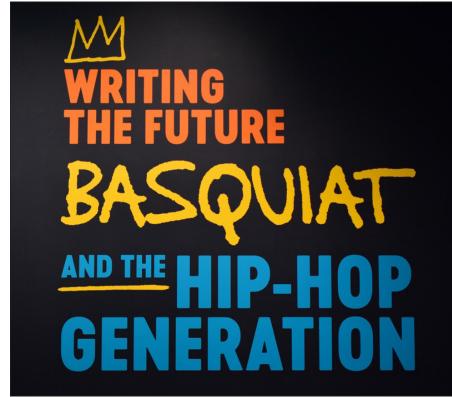


6 THE TECH THURSDAY, OCTOBER 29, 2020

ART EXHIBITION REVIEW

Writing the Future distills the artistic origins of hip-hop culture into a coherent experience

The MFA's latest exhibit beautifully captures the diverse voices of 1980s New York street art



The MFA's exhibition Writing the Future: Basquiat and the Hip-Hop Generation displays the anti-establishment themes of 1980s New York street art.

By Raj Movva

1980s New York street art was about subversion. Subversion of the dominant trends on canvas, ves, but also a broader subversion of how art gets made and who gets to make it. Subversion of the police and their attempts to stifle the burgeoning hip-hop movement. Subversion of society's supposed economic and scientific advancement, which failed to deliver progress to the most marginalized.

Writing the Future, now on display at the Museum of Fine Arts, beautifully captures this anti-establishment energy in all its glorious heterogeneity. The exhibition centers on Jean-Michel Basquiat, perhaps the most well-known of the so-called "post-graffiti" artists. Basquiat's works are most distinguished by their liberal use of text; much of his art features short phrases and rough sketches of objects and symbols littered across the canvas. It's up to the viewer to sift through this thought-dump and find meaning, which ends up being a pretty entertaining task. Sometimes, as in Hollywood Africans, there are clear messages of social commentary, whereas a piece like Untitled (1983) offers several cryptic panels of text to mull over. I spent several minutes staring at the latter work, every few seconds finding another amusing connection between the different words and icons on the canvas.

These iconic Basquiat canvases are riveting, and the sheer number of them alone probably makes Writing the Future worth the visit. But unlike Basquiat shows before, this one stands out for all its other details. Walk down the steps leading in, and you're met with a montage of clips from the 80s of graffiti, breakdancing, and DJ-ing. Open the door to the exhibit, and you'll hear music playing — the likes of Kurtis Blow and Whodini, who established the roots of rap as we know it today. You can't help but tap your foot to the beat.

Then, in that first room, instead of just a wall of solo paintings, you're instantly greeted by unorthodox, collaborative pieces. There's Basquiat's leather jacket, signed by him and several of his friends, highlighting the intersection between fashion and the hip-hop movement. In the middle of the room, you'll find the Fun Fridge, a Dada-esque refrigerator full of tags from contemporaries like Fab 5 Freddy and KooL KooR. These initial moments at the exhibition immediately set the tone for your ensuing immersion in 80s street art and all its subcultures. Thanks to the music and the chaotic structure of it all, the vibe the whole way through is casual and experiential, a welcome twist from the typical buttonedup nature of established art galleries. In that sense, the exhibition upholds the same nonconformist ethos that guided Basquiat and his peers.

But if the post-graffiti movement truly was a democratic approach to the arts in which all had a say, shouldn't we be celebrating more than just Jean-Michel? Admittedly, Basquiat and all his modern cachet were what convinced me to attend, but the rich diversity of creative styles made me stay. The first couple of rooms introduce Basquiat's supporting cast as central to his work, but the rest of the exhibit forces you to recognize the prodigiousness of their work on its own. A-One and Fab 5 Freddy's use of vibrant, clashing colors span large sections of the wall, analogous to how their graffiti might've looked on the metal doors of the subway. In Untitled (Yellow and Black), Keith Haring's distinctive use of bold lines to express energy and movement is married with LA2's rich hues and precise calligraphy.

To me though, the standouts were Rammellzee and Lady Pink, for whom the exhibit managed to convey a broader ideology beyond their artistic styles. Rammellzee was the founder of "gothic futurism," a subculture of Afrofuturism that revolts against the English alphabet as a medium for change. On the one hand, part of his oeuvre directly subverts oppressive power structures as in Super Robber, but his other works ascend past the worldly to imagine an unbounded, interstellar future free of authoritarian control. Even within this latter category, Rammellzee manages to carve out distinctive styles: in Evolution of the World, he carefully constructs a galactic universe with precise lines and a consistent color palette, while Gothic Futurism Ratio Envelope Map-A-Matics Star Emplosion uses the soft textures of spray paint to place planetary objects onto a dynamic, atmospheric background.

Meanwhile, Lady Pink is a Latina woman whose femininity is a core tenet of her artistic identity. Instead of rejecting her femininity to fit in with her peers, she embraces it; Yellow Building uses loud yellows and pinks to depict an imprisoned woman peering into a decaying cityscape. In *Tear Ducts* Seem to Be a Grief Provision, Lady Pink collaborates with Jenny Holzer to grapple with death, acknowledging the emotions of loss but in a tough, resolved way. Lady Pink's

Writing the Future: Basquiat and the **Hip-Hop Generation**

Curated by Liz Munsell and Greg Tate

Museum of Fine Arts, **Boston**

On display from Oct. 18, 2020 to May 16, 2021

unique intersectional voice comes through in the exhibit's selected works, but she's still presented in a way that naturally interlaces with her contemporaries.

When walking through a gallery, I'm often wondering how the works in front of me were perceived by people who grew up with them. Basquiat is now a staple in art history curricula, but what did 80s New Yorkers on the subway think of him? Writing the Future has an answer to that, too. Next to the standard information panel, many of the works had additional quotes from artists, activists, and community leaders with relevant cultural knowledge. These voices offer key additional context, for example by speaking to what Rammellzee meant for the larger Afrofuturism movement or how Lady Pink's work was influential to other young girls wanting to break into the scene. It's another nice touch that gives the exhibition more of a grassroots, art-for-everyone feel.

In curating Writing the Future, Liz Munsell and Greg Tate are faced with a difficult task: distilling such a multifaceted, evolving era of culture into the narrow confines of a museum gallery. Ultimately, they've built an innovative, immersive space that pulls it off with grace, subverting many of the standard principles that define traditional Eurocentric art shows. The art's been stuck in my head for days since my visit, and I'm left craving a similar vibe in the future exhibitions I'll attend.



COURTESY OF MUSEUM OF FINE ARTS, BOSTON Fun Fridge is a Dada-esque refrigerator with tags from Basquiat's contemporaries.

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How the leopard gets its spots Alan Turing and the math behind biological development

By Albert Liu

Every computer scientist is familiar with some of British mathematician Alan Turing's contributions to the field, from creating arguably the first computer to greatly advancing computability theory. However, outside the world of algorithms and electronics, one of Turing's most important scientific legacies is in a seemingly disjoint field entirely: developmental biology.

For some background, one of the key questions in developmental biology is how a single cell, the zygote, can generate the complex pattern that is an organism. The consensus today relies on chemicals known as morphogens, whose distribution dictates the morphology, or overall form, of the organism as it develops. For example, the first discovered morphogen is a gene in fruit flies known as Bicoid, whose product concentrates in the front of an embryo and canonically helps establish what is known as the A-P axis — it demarcates which side is the front and which side is the back. Since the discovery of Bicoid, dozens of other morphogens have been reported, and how these compounds interact during the course of development remains an area of intense research.

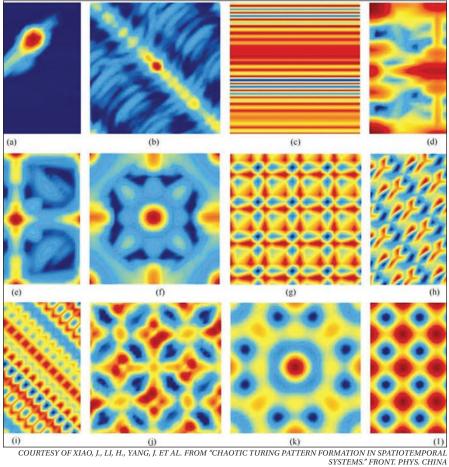
But how did the concept of morphogens arise? As it turns out, the term itself was coined by Turing in his 1952 paper, "The Chemical Basis of Morphogenesis" (Turing, Alan Mathison. 1952 The chemical basis of morphogenesis. Phil. Trans. R. Soc. Lond. B 237: 37-72). Within this paper, Turing outlines that in order for a set of chemicals to shape a complex organism, there must be a mechanism to break the symmetry of its embryo. The developing embryo is initially roughly spherical and homogeneous, meaning that no part of the cell is more likely to grow into a head or arm than any other. It's seemingly impossible that random fluctuations within such a uniform system could lead to a patterned distribution of morphogens. However, Turing showed that with a combination of chemical kinetics (reaction speeds) and diffusion, structures now eponymously known as Turing patterns emerge.

Turing patterns rely on the synthesis of morphogens at a specific location, as well as the flow of morphogens between locations. The simplest such system to analyze relies on two morphogens within many different cells. The rate of synthesis of each morphogen is dependent on one anothers' concentrations. However, if only chemical kinetics are considered, no spatial pattern would be produced, since no information is traveling between cells. This is where diffusion plays a role: each cell is able to exchange chemicals with its immediate neighbors based on the concentration differences of each of the two morphogens. With these two factors, this type of setup is known as a reactiondiffusion system.

Physics aficionados and those familiar with coupled differential equations will recognize this as similar to the setup for coupled oscillators and standing waves on a string. Without delving too deep into the math, these types of systems gradually shift towards a stationary pattern. As it turns out, reaction-diffusion systems also establish a semi-regular wave pattern of concentrations, which are the Turing patterns.

This type of reaction-diffusion system appears in many places throughout nature. In developmental biology, Turing patterns are commonly found on the skin. For example, the pattern found in a leopard's spots have been rationalized as Turing patterns. Other animals can be found to have Turing patterns as well, such as the stripes on a zebra or the maze on a puffer fish. Even humans have examples of Turing patterns: your fingerprints can be modeled as Turing patterns, as can the distribution of sweat glands, etc.

Turing patterns have also been found to be far more pervasive than just in the realm of biology. Indeed, while the original "reaction-diffusion" system was proposed for a biological model of cells, many other phenomena exist because of a movement of material coupled with formation of structures. For example, the shape of sand ripples in a desert as well as star formations within galaxies can be traced back to Turing-like patterns. Even modern-day materials science has manifestations of Turing patterns. One instance is in liquid crystals, a phase of matter with applications including optical displays and biological membranes, among others. Recent studies have shown that even these materials exhibit Turing patterns, with isomerization reactions occurring in standing wave-like



Turing patterns spontaneously arise in a wide variety of chaotic yet beautiful structures.

As powerful as Turing patterns are in explaining symmetry breaking processes, they do not fully explain how these strange designs give rise to something like an animal. One of the main challenges to moving from an elementary treatment of Turing patterns to explaining developmental patterns is exactly this: Turing patterns break from spherical symmetry to the strange symmetry possessed by the patterns themselves. Explaining how to break from this, in turn, requires focusing on the nature of the morphogens. In biology, most molecules are chiral, meaning that they are different from their mirror image. For example, while a basketball is achiral, since it's the same as its reflection, your hands are not your left and right hands are distinct. In the same way, biological morphogens are "left"

and "right" handed, which biases them to react in certain ways. Although the details are complicated, it's not difficult to see that morphogens with an intrinsic handedness can give Turing patterns polarity, which eventually leads to the form of an organism.

Turing patterns represent a fascinating understanding of symmetry and asymmetry in nature. And while scientists currently implement more complex modifications of the basic Turing model, due to the volatility of Turing patterns, this type of analysis still is quite powerful. The power of Turing's application of mathematics in biology helped establish the canon to this day. Although his life was limited by his untimely death two years after he published this paper, Alan Turing's contributions and the beauty of his patterns certainly are not.

SCIENCE SCIENCE



8 The Tech
Thursday, October 29, 2020

Learning Equity and Diversity postpones microaggressions and bias workshop to review after Trump executive order

ICEO Head Dozier writes that the order will not be 'disruptive' to MIT's 'bias-related training' programs

By Cher Jiang

The MIT Social Justice Programming and Cross Cultural Engagement Intercultural Center (SPXCE) will reschedule a Learning Equity and Diversity (LEAD) workshop, titled "Microaggressions and Implicit Bias," that had originally been slated for Oct. 15. The decision comes after President Donald Trump issued an executive order Sept. 22.

The order prohibits federal contractors and grant recipients from teaching members "divisive concepts" in the form of diversity trainings or instructional materials.

Institute Community and Equity Office (ICEO) Head John Dozier

wrote in an email to *The Tech* that he expects the policy will not be "disruptive" to MIT's "bias-related training" programs.

The order states that "many people" in prominent institutions propel a narrative in which certain individuals "are oppressors" based solely "on their race and sex." The order writes that the aim of the policy was to prevent this type of "scapegoating" from being officially endorsed by federally-funded organizations.

The order provides examples for what it deems to be "malign ideology," including an excerpt from a Department of the Treasury employee seminar. The seminar stated that "virtually all White people, regard-

less of how 'woke' they are, contribute to racism."

The executive order also writes that according to research, "blamefocused diversity training reinforces biases and decreases opportunities for minorities."

LEAD's webpage states that the workshop, designed for staff members, would have included an "implicit bias test" for participants and techniques for "disrupting microaggressions." The goal was to arm staff members with "theory" they could apply to "student interactions."

Associate Dean for Intercultural Engagement La-Tarri Canty wrote in an email to *The Tech* that "an abundance of caution" preceded the decision to not hold the workshop on the original date. MIT will review the contents of the workshop so it can "be confident that the workshop meets the executive order's requirements." For now, the program is "still unpacking" the implications of the executive order.

Canty also wrote that SPXCE's "programming focuses on learning and building" and does not "assert that anyone is an oppressor based on their race or sex."

Dozier wrote that he believes that "using stereotypes to teach or discuss the danger in stereotyping is ineffective and even counterproductive."

Dozier added that "offering historical and cultural context when

discussing bias is not stereotyping" and that, from the perspective of the ICEO, consideration of such "cognitive bias research" is in fact necessary to addressing "the biases we all harbor regarding the people we live, learn and work with."

In addition, Dozier wrote that for contractors of the federal government, the executive order takes effect "60 days after the date of its issue," which would fall after Election Day. Dozier wrote that "the outcome of the general election will almost certainly affect the execution of this order," making it difficult to decisively anticipate the impact of the order until the results of the election are

Ghez: 'MIT was my first choice, clearly above' all other undergrad institutions

Nobel Prize, from Page 1

gravity starts to mix space and time. You get into these conundrums that are very fascinating — just by how we experience gravity in our everyday life.

I was fortunate enough to do an REU [MIT's Research Experience for Undergraduates Program], an undergraduate research project, so I participated in research effectively every year I was at MIT. I have to say I was just hooked. Once you get involved in this world of research, it's compelling. I love using telescopes, I love programming, I love thinking about future satellites. And I'm so grateful to [physics professor emeritus] Hale Bradt [PhD '61], who supported my education, really, because when you work with undergrads — and I appreciate this also from a faculty perspective — there's so much teaching that goes into it. He was really generous with his time and provided me with opportunities that were rather amazing, in terms of both working on future x-ray satellites and getting to go to the telescopes.

MIT is so good at high-energy astrophysics, and black holes — smaller kinds of black holes, in particular — is what we were interested in. The ordinary-mass black holes, looking at the high energy properties with X-ray satellites and then finding optical counterparts to these things at MIT telescopes. And I think that's when I discovered the wonderment of these objects.

TT: What led you to choose to attend MIT of all places for your undergraduate degree, and what work did you initially envision yourself doing as an undergraduate student?

Ghez: I applied early action. I really wanted to go to MIT; MIT was my first choice, clearly above everything else. In fact, when I was admitted, I threw out all my other applications, to a little bit of my father's disappointment. To me, MIT was just the perfect school. I really fell in love with it well before I attended. I really wanted to go into math and science. There was no debate about the general direction.

To me, MIT offered everything — it just seemed like the perfect university. It catered to those who were interested in math and sci-

ence, and when I got there, I was like "Oh, I'm with my people." It was a fun university.

I have to say, MIT is such an interesting place — even the idea that it has a strong Greek system. I actually lived in a co-ed frat when I was there, so it was this combination of a place that people who loved math and science could go to and still have fun. [Ghez was a member of the Number Six Club.] It had a great art museum and had these living groups. It just was like nirvana to me.

I met some of the most interesting people there, and [the community resonated with me. People were really interested in math and science, yet had a lot of other things going on like sports. It was a place you could nurture those other aspects. At the time, there was the requirement that you had to take basically on average one humanities class every quarter, and I loved the idea that there was sort of this expectation that you maintain this other aspect of yourself, that even though you're going to a school that's fully committed to math and science, it was a school that was interested in helping you develop fully as an intellectual individual.

TT: What are some of your most memorable moments at MIT?

Ghez: Oh gosh, I had so many of them. Going to Chile to use the telescopes — just being up in the middle of the night and learning to use the telescope — was an amazing opportunity.

It's so funny because you know being in college comes with so many different aspects of life. I loved having dinner at Number Six, making the nightly trek, finding an empty classroom to study in with friends. There's something about the shared comradery of studying hard but not forgetting to have fun. Every weekend we would go out dancing, and I had so much fun as an undergrad, but I worked really hard

That's what really stuck with me at MIT — this group of people that was really committed to science and engineering and all these very curious pursuits, but on the weekend were very committed to going out and having some fun. They're not specific memories, but just living life fully.

TT: What were some of your favorite classes or activities as a MIT student?

Ghez: Logic, Language, and Values was one of the humanities classes I had to take, and it just happens to have stuck with me. I think it was philosophy. Another was an intro to astrophysics and astronomy class [8.282]. During 8.02 (Physics II: Electricity and Magnetism) in 26-100. I can remember the lecture that stuck with me the most, which is when we were doing Maxwell's Equations in Walter Lewin's class. He had 400 daffodils for us to celebrate that we had learned these equations, and we could each take a daffodil home. What he did was so clever, like this beautiful celebration of something that was so significant for the class, so that was hard to forget.

TT: Do you have any professors that really impacted you and your work?

Ghez: Hale Bradt, for sure. I think he was one of my discussion leaders in 8.01, and then he taught that introductory class. But 8.01, that's how I ended up working with him. I worked with him all four years through REU, and it was just a wonderful opportunity. I have to say we had a nice interchange because in addition to doing the REU program, I also had a job working in the MIT List gallery, and he ended up participating in a show there. I still stay in touch with him to this day and I'm so grateful for the opportunity he gave me as an undergrad. I mean MIT is amazing in the way they treat their undergrads and give them these amazing research opportunities. An important part of the MIT experience [is how] it really emphasizes the word "go." And [Bradt] was so generous in terms of introducing me to a lot of different aspects of astrophysical research. Professor Claude Canizares, who was my academic advisor, was also very encouraging. I think Hale was the primary person, when I think back, just proportionately above evervone else.

TT: As a role model for many, do you have any advice for current MIT students?

Ghez: Pursue things you really enjoy, and keep trying new things, because we don't know what we enjoy until we try them. I think those are the most important things. If you enjoy what you do, it doesn't feel like work. I'd also say that anything that's interesting also comes with a certain number of challenges, and

if you're passionate about what you do, I think you'll have the fortitude to overcome any obstacles.

TT: What inspires you in your work?

Ghez: I think when I'm most inspired is when things don't make sense. I do a lot of work on developing new technologies and methodologies. And the wonderful thing is when these technologies give you a really different view on the universe, you can find things that are inconsistent with our current understanding. That's what's most interesting to me — when things have been turned upside down by a new piece of evidence, you have to think about, well, how do you sort out those problems that our current models don't explain? That's when I think research gets the most

TT: Do you have any future plans for your research?

Ghez: I'm going to keep going. There's just so much more to do. We're really in the midst of not only having answered the questions that we set out to answer, but also [having] revealed more questions than answers. And there are so many new directions to pursue about understanding supermassive black holes: how does gravity work near super massive black holes? What astrophysical role do these black holes play in the formation and evolution of galaxies? In that arena, so much of the observations have been inconsistent with the data that we have. That tells you there's a lot more to be done to further our understanding. It's exciting, I'm thrilled to see this, but in no way do I feel done with the research. It's become more and more interesting

TT: What are some applications of your research that you look forward to?

Ghez: It's definitely basic research, it's not the realm of applied research, where you know that there's some invention where you're going to apply it to a different arena. Where it does lead you is to the next step, the next question to ask about understanding how our universe works, understanding the physics, the astrophysics of it. For me, the next steps are all about furthering our fundamental understanding of the universe and training the next generation of students.

TT: What are some of your experiences as a woman in science, and what motivated you to advocate for them?

Ghez: It's always interesting when you're a minority in any field. I feel very fortunate to have been at MIT, because MIT is a place that has always been very forward-looking in the sense that for all of its history, there's always been women there. They may have been in very very small numbers, but they were never excluded, and I think that fundamentally changes the institutional relationship to women. I always felt very welcome at MIT, and I met some of the most amazing women

I think one of the things I understood when I was a student there was that when you're a minority, it's very hard to be mediocre. They're all pretty amazing. I think the doubt that people have or any questions that people have really discourages women if they're not at the very top of their game. I think that being a minority drives you to work harder because you really have to prove that you belong there.

I like to say that you're guilty before you're assumed innocent, or accused stupid until you prove you're smart, so it really pushes you to prove that you belong there.

One of the things I remember at some point [is that] as a student, you start to wonder because the numbers get low, especially in physics, whether or not you belong. The thing I used to think about is "Am I in the wrong playground?" because there are so few people who look like you. And so I started to understand when I was at MIT the importance of visible role models.

That's why I do my teaching today at the introductory undergraduate level, because I think that's how you can demonstrate to young women and young men that women are part of this field. It's not that you have to preach about it, you just have to be visible.

Similarly, I've been very fortunate to work at a program that is of interest to the public, so I guess this is what led me to be willing to spend some time working with people doing documentaries. I think that's the most effective way you can change things: to talk about science, from the public engagement of science, which is now more important than ever, and just to be visible.

Grading and other regulations to be announced later in the fall semester

Spring Semester, from Page 1

likely resemble those of Fall 2020, including quarantine week and regular testing. The presentation writes that during Fall 2020, there have been "very few examples of possible

transmission on campus among positive cases."

MIT expects to hold about 160 classes with in-person components in the spring, compared to 120 classes with in-person components this fall, according to the presentation.

Independent Activities Period (IAP) will be held remotely Jan. 4–29.

Final exams will take place May 24–27, following a three-day "reading period." Commencement will be June 4. The calendar also includes Campus Preview Weekend, set to take place from April 15–18.

Compared to the "normal" spring calendar of 65 teaching days, Spring 2021 will have 62 teaching days and end on May 20, Danheiser and Canavan wrote.

MIT declared a "significant disruption" of academic activities for the 2020–2021 school year in June,

and Emergency Academic Regulations for the Fall 2020 were announced Aug. 10. Danheiser and Canavan wrote that further Emergency Academic Regulations, including the IAP and spring grading policies, will be announced "later this fall"

Thursday, October 29, 2020

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Bronze	Article ad	1/8 page	\$300/week

Spooky

Solution, page 12

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

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.

Scary

Solution, page 12

20×		10+		5+	
	5–		30×	9+	30×
2		4			
120×		6		2×	
3		20×		5–	
6		24×			

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.

Weather-wise doings by Brad Wilber

Solution, page 12

ACROSS

- 1 100-yard race
- 5 Place to park a car
- 8 Natural bandage
- 12 Not married
- 14 Very long car, for short 15 Volcano's outflow
- 16 Long look 17 Prayer-ending word
- 18 Change for a \$5 bill 19 Windy-day playing with a
- toy in the air 21 Was dressed in
- 22 Toward sunrise
- 23 Unexpected victories
- 25 Back of a boat
- 28 "Recent" prefix for natal
- 29 "... and all ___ jazz"
- 30 Out of town this week
- 33 Locations
- 38 Rainy-day viewing of funny TV shows
- 41 Nebraska city
- 42 "How long has it __?" 43 A Great Lake
- 44 By way of, on an itinerary

- 46 Neglected to, for short 48 Buckle up, as a seat belt
- 52 Egotistical
- 54 Female choral voice
- 55 Hot-day basking at a beach
- 61 Ink smear
- 62 "It's clear now"
- 63 Helicopter blade
- 64 Valentine's Day emotion
- 65 Religious splinter group 66 Performance with sopranos
- 67 Lambs' mothers
- 68 "For shame!"
- 69 TV industry award

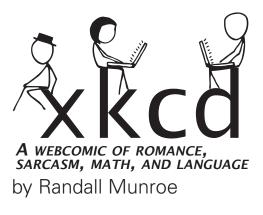
DOWN

- 1 Nightfall
- 2 Prefix meaning "opposed
- 3 Smack, as a housefly
- 4 "The buck stops
- 5 Maximum speed on a road
- 6 Sign of the future
- 7 __-in-cheek (insincere)

- 8 Reduces one's speed 9 Small boat that's paddled
- 10 Avoid, as a crisis
- 11 Air Force locations
- 13 Delay until a later time
- 20 Hawaiian porch
- 25 Dishonest imitation
- 26 "See ya later!"
- 29 One more than one
- 31 Female hoopsters' org.
- wine
- 36 Give off, as light
- 39 Possess
- 47 Emcee's opening speech 48 Story from Aesop
- 49 Give permission for

- 14 Installs, as a carpet
- 24 Blog entry
- 27 Carve a design into glass
- 28 Wall Street market: Abbr.
- 32 Improve with time, as
- 34 Cooled with cubes
- 35 Tattered and __ (raggedy)
- 37 NNW opposite
- 40 Taj Mahal's country
- 45 Refuse to compromise
- 18 22 23 24 30 31 32 33 | 34 | 35 | 36 39 46 55 56 62 64 65 66
- 50 Cooking appliance
- 51 Carryall bags
- 52 Sweater style with an angled cut
- 53 Aid and __ (assist in crime)
- 56 Puts into service
- 57 Optimistic feeling
- 58 Line on a list
- 59 Typical result 60 Color of overcast skies

[737] Yogurt









again for the two weeks preceding that date.

Skeletons

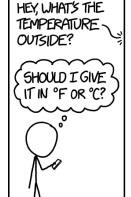
Solution, page 12

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

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.

A WEBCOMIC OF ROMANCE, SARCASM, MATH, AND LANGUAGE by Randall Munroe

[1643] Degrees



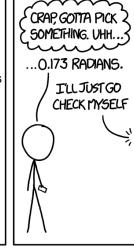
DEGREES CELSIUS

- INTERNATIONAL STANDARD
- HELPS REDUCE AMERICA'S WEIRD ISOLATIONISM
- NICE HOU "NEGATIVE" MEANS BELOW FREEZING
- PHYSICS MAJOR LOYALTY
- EASIER TO SPELL
- WE LOST A MARS PROBE OVER THIS CRAP

DEGREES FAHRENHEIT

- 0°F TO 100°F GOOD MATCH FOR TEMPERATURE RANGE IN UHICH MOST HUMANS LIVE
- ROUNDS MORE USEFULLY (70's, 90's)
- UNIT-AUARE COMPUTING MAKES IMPERIAL LESS ANNOYING
- SI PREFIXES LESS RELEVANT FOR TEMPERATURES
- FAHRENHEIT LIKELY MORE CLEAR IN THIS CONTEXT
- VALUING UNIT STANDARDIZATION OVER BEING HELPFUL POSSIBLY MAKES ME A BAD FRIEND





"Radians Fahrenheit or radians Celsius?" "Uh, sorry, gotta go!"

12 THE TECH THURSDAY, OCTOBER 29, 2020

MIT alumna Christina Birch qualifies for **Tokyo Olympics 2021**

Christina Birch qualifies for the shortlist of the Cycling Long team for the Tokyo 2021 Olympics

By Maya Abiram

The future for MIT students isn't always just science and tech. MIT alumna Christina Birch PhD '15 is making waves, qualifying for the shortlist of the Tokyo 2021 Olympics Cycling Long team. Her feat is especially interesting as she was able to utilize the skills and experiences she gained at MIT to help her with her cycling success.

Christina started cycling in the fall of 2008 when she first moved to Cambridge. She would go out on rides with the MIT Cycling Club, regularly cycling rounds of 25-30 miles. She received support and encouragement from the club. "I was new and inexperienced and didn't know how to eat or drink on the bike. Nick Loomis, club president at the time, stayed behind with me and rode at my pace," Birch explained. She realized that cycling was not purely meant for exercise and fitness. It was a team sport where she could build a close and supportive community.

At the backbone of her success is a rigorous workout routine. "Leading up to a race, I train with my teammates at the Olympic Training Center velodrome in Colorado Springs, Colorado. We will spend [around] two weeks doing very hard training before travel and tapering before a World Cup." Birch frequently also does "double-doubles," or two back-to-back days with two training sessions on the velodrome. The COVID-19 pandemic has caused a shift in her routine. Her workout now focuses on foundational fitness. "I've been doing some big weeks (20-22 hours of training) that includes some track work for intensity (100% maximum efforts), gym (two times a week), intervals on a road bike (two times a week), and a very long endurance ride (5-6 hours)," Birch described

She was also able to utilize the skills she learned at MIT to enhance her preparation for races. Birch's approach to training is extremely data-oriented. "I track my

training using power output (watts or looking at time spent at certain kilojoules burned per hour) and monitor trends over short (week) and long (season/year) time periods." This approach is especially useful in the type of cycling that Birch competes in: track cycling. Track cycling is perhaps the most analytical type of cycling, using aerodynamics and optimization to create the best strategies to minimize time. She also channels her love of teamwork that was fostered in her PhD lab at MIT into her cycling. Both environments allow members to succeed by supporting and relying on others in a community.

Birch's PhD is in bioengineering, a subject she was able to incorporate into her cycling in various ways, like scientific networking, something she unexpectedly found through cycling events. "During a collegiate road race in Ogden, Utah, I started chatting with another rider from Duke. It turns out she was a grad student working in the lab that had generated a thrombin aptamer I was using in my own research!" Birch was able to form scientific connections and discuss her own work with many cyclists she met across the country. Many students are unsurprisingly conflicted over which of their passions they want to pursue in the future, but Birch combined two seemingly unrelated fields, excelling at both. As she advises, "Moral of the story: if you're excited to talk about your passions — research and cycling or whatever it may be — you will find interesting people who are interested in what you're doing too!"

While cycling is an intensive physical sport, for many cyclists, the biggest hurdle is the mental challenge of competition. Birch thrives in competition settings by pushing herself and facing huge challenges during training. Extremely difficult training sessions can build mental strength that allows cyclists to thrive and persevere in a competition setting. She explained, "When I get



Christina Birch PhD '15 cycles with Team USA in the Team Pursuit event at the 2019 Track Cycling World Championship in Brisbane, Australia.

to a race, I am relaxed, excited, and always looking forward to it because I know I've already done all the hard work and preparation to the best of my ability. All that is left is to execute the race plan as best I can." During the pressure of a race, she assesses each situation calmly and rationalizes the different options she has on the table. She adopts a survivalist mentality and asks herself, "this is my new reality; now what am I going to do

Birch also left a message for current student athletes who might be struggling to manage intensive workouts along with the rigorous MIT curriculum, as well as any students managing stressful lives. She notes:

"I am definitely what some people might classify as a lifetime 'high achiever,' yet I strongly believe that are some things that are more important than achievement. The things even more important than a degree from MIT, more important than sport, more important than the Olympics are

you, your happiness, and your relationships. You might not feel that way, now or ever, but I guarantee there are people in your life that believe that you and your well-being are more important than any of the 'things' you are doing. My friend and teammate Kelly was an incredibly kind, funny, and humble human being. She was also a Stanford PhD student, author, first-chair violinist, Olympic medalist, World Champion — all at the same time. She died by suicide in March of 2019. She described her life, shortly before her death, as juggling with knives. Instead of Kelly's knife-juggling, I prefer the glass and rubber ball analogy: you're jugging 50 (not five) balls in the air, and the key is to be able to identify which ones are rubber (and will bounce if dropped) and which ones are glass. Your health and happiness is the most important glass ball of all. I loved Kelly fiercely as a friend and teammate, and some of my favorite moments of my track cycling journey involve my friendship with her —

Solution to Spooky

chats about life and values in our shared hotel room, seeing the School of Rock musical together as a team, riding on her wheel in training. Those memories of connection and shared human experience are the stories I will tell, not the ones about winning a world cup, or setting a power record or personal best time, or whatever. I see the same incredible drive and talent in all the MIT students I know as I did in Kelly, and I worry that MIT students do not view asking for help as the real, all-toorare strength that it is. Vulnerability is the most courageous act, be it walking to the start line of a race, or reaching out to a friend for help when you're overwhelmed. There is someone, at home, at MIT, or online, that believes your happiness matters most of all. Let those rubber balls bounce."

The MIT community is exceptionally proud of Christina Birch and cannot wait to see her excelling in future endeavors and living happily, healthily, and successfully.

Solution to Scarv

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



from page 10 6|2 1 5|3 4 9 6 2 3 1 9 4 6 5 7 8 5 6 4 5 9 3 7 8 6 2 1 3 6 5 4 3 2 4 5 8 1 9 6 7 5 6 8 7 9 2 1 3 4 3 6 5 2 1 1 7 6 3 4 8 5 2 6 9 3 8 2 7 4 1 5 5 4 6 7 4 5 1 6 9 2 8 3 6 5 3 1 8 2 4 5 3 7 9 6 **Solution to Doings Solution to Skeletons** 1 6 3 8 7 2 4 9 5 5 2 7 9 3 4 6 8 1 4 9 8 5 6 1 2 3 7 STERN NEO THAT AWAY SITES WATCHINGSITCOMS OMAHABEEN ERIE 6 4 2 1 8 9 7 5 3 3 7 9 2 5 6 8 1 4 8 5 1 3 4 7 9 2 6 VIA DII 7 8 5 6 2 3 1 4 9 ALTO SUNBATHING BLOT ISEE ROTOR LOVE SECT OPERA EWES TSK EMMY