

Lara Ozkan '25 receives 2025 Marshall Scholar

Ozkan: "MIT has been the most transformative experience of my academic career"



PHOTO COURTESY OF IAN MACLELLAN

Lara Ozkan '25 is a 2025 Marshall Scholar.

By Aneesh Sharma & Vivian Hir

Lara Ozkan '25, a Course 6-7 major, was recently selected as a 2025 Marshall Scholar. Founded in 1953 by the British Parliament, the Marshall Scholarship supports up to three years of fully funded graduate study in any university in the United Kingdom for American students.

As a Marshall scholar, Ozkan will first pursue a MPhil in biological science at Cambridge University in her first year, and then a master's in artificial intelligence and machine learning at Imperial College London in her second year. In an interview with The Tech, Ozkan discussed her wide array of interests, including computational biology research and technology policy.

TT: What was your journey of applying for the Marshall Scholar program? How did you feel when you were selected as a Marshall Scholar?

Ozkan: I had heard about Marshall and other big fellowships back during my sophomore year, but it always felt like a very elusive concept. I thought it was a big reach because it seemed like the people I knew who had achieved these scholarships were at the top of their field. However, this junior spring, I saw an email from the fellowship advising office saying, "Submit your pre-application." So, I took a stab at that and tried my best.

At the end of it, I was lucky enough to get one of the endorsements. It wasn't easy because it required four to eight recommendation letter writers and reaching out to a lot of professors.

I was really lucky that I had a lot of people willing to write good things about me and support my application. Once I finished, there was just a period of waiting. Then, I found out I got an interview about a month later, so I went to New York City to the British Consulate. A few days later, I got a phone call that I was accepted. I was super excited with lots of happy tears.

TT: What do you intend to do as a Marshall Scholar? What are your long-term professional goals?

Ozkan: For the Marshall, I'll be in the UK for two years. My first year will be at Cambridge, studying biological sciences. The main kind of topics I'll be looking at are computational genomics and understanding sex-specific differences in diseases. That's something that I started working on at CSAIL with Prof. Manolis Kellis. I'm excited to see an extension of that at Cambridge, and hopefully collaborate between the two institutions, because a lot of cool work is being done between the two. In my second year, I'll be at Imperial College London, and I'll be getting a master's in computer science, but more specifically, artificial intelligence and machine learning.

I'm especially excited about exploring the policy and regulatory landscape in the UK. Understanding AI and technology policy is something I've always been focused on. With the EU AI Act coming out and everyone understanding their regulatory approaches to AI, there's a very interesting intersection between a more hands-off approach and a more stringent regulatory approach. That's something that I hope to explore in both my years at Cambridge and Imperial.

TT: How has your experience at MIT shaped the person you are today?

Ozkan: MIT has been the most transformative experience of my academic career because a lot of the opportunities I've been getting here would be really hard to find elsewhere. One of the main drivers of wanting to apply to Marshall is connecting with people, aside from just being a research scientist.

One experience that stands out to me is working with the MIT Media Lab Conformable Decoders group. We worked on wearable electronics, and one of the projects I was heavily involved in was our wearable breast ultrasound device. I was on the data side of device fabrication, but the

most impactful part was bringing this device to the market. For the past year and a half, I've been working with the Deshpande Center, which supports innovations that come out of labs to reach people. Our goal with this wearable ultrasound breast device is to bring wearable ultrasound to women at home.

The Deshpande Center showed me how impactful the business components of these innovations are; I've been interested in entrepreneurship and the start-up culture at MIT ever since I got here with undergraduate organizations. But working on this device in a real-world setting helped me realize the true impact of entrepreneurship and science. That helped me in the Marshall process as well because it gave me a slightly deeper perspective on the research in terms of people.

TT: What advice do you have for MIT students interested in fellowships like Marshall?

Ozkan: The end goal was never, "I want to be a Marshall Scholar." It just ended up that all of my interests aligned with the Marshall values. If you had asked me during my freshman year why I was applying to SBC, it would have never been, "So this can align with certain scholarships."

I think that helped throughout this application process because I had applied to a lot of different fellowships, and I instantly clicked with the Marshall people. Everything I had done at MIT, I went for because I enjoyed it. You have so many opportunities at MIT, so take advantage of the ones that sound interesting to you because it is impossible to know where you'll end up in your senior year.

The end goal, per se, should just be having a good time, in terms of just meeting great people, being able to put on events that matter to you, and joining research projects that make you excited. And that's what I did. If you're true to yourself, you can speak well to what you like, and you'll end up finding the scholarship or community that works the best for you.

Picard apologizes for Chinese student comment at 2024 NeurIPS conference

By Vivian Hir
EXECUTIVE EDITOR

On Dec. 13, 2024, MIT Media Lab Prof. Rosalind Picard's keynote presentation at the NeurIPS Conference sparked controversy for her comment about a Chinese student. Picard is the founder and director of the MIT Media Lab's Affective Computing Research Group, which focuses on "bringing together Emotion AI and other affective technologies" to improve human wellbeing.

Titled "How to optimize what matters most," the keynote presentation had a slide with a quote from a Chinese student who was expelled from a top university for using AI. The student allegedly said, "Nobody at my school taught us morals or values." Picard included a note on the bottom of the slide saying, "Most Chinese who I know are honest and morally upright."

In a Q&A session, a Chinese attendee asked Picard to clarify the reason that she included the student's Chinese nationality in the example, given that other examples in the presentation did not mention nationality. Picard replied, stating that the student's quote was a reflection that the "school was not teaching it [morals], which meant that it applied to a lot of people there." The attendee responded to Picard, requesting that she remove the note about nationality in the future because of its "unconscious bias."

Picard's slide and video was shared on X and other social media sites, drawing criticism from the Chinese and Chinese American community. "This choice perpetuates harmful stereotypes about Chinese scholars and reflects a broader bias against Asians," UMD Computer Science Professor Furong Huang said in a post on X. Other posts echoed Huang's sentiments, criticizing Picard for racial bias and stereotyping.

After the talk, NeurIPS posted an

apology on X, stating that the comments Picard made did not adhere to NeurIPS's values of diversity, inclusion, and equality. On Dec. 14, Picard issued an apology for stating the student's nationality in her presentation. "I see that this was unnecessary, irrelevant to the point I was making, and caused unintended negative associations," Picard said.

On Dec. 16, the MIT Graduate Student Union (GSU) and MIT Chinese Students and Scholars Association (CSSA) published an open letter requesting Picard to revise her apology. "Her statement falls short of fully acknowledging the negative impacts her comment has had on the academic community and on perceptions of Chinese individuals," the letter stated.

In addition, the letter called on President Kornbluth to issue a statement affirming MIT's continued support of Chinese community members and recognizing the negative impact of Picard's remarks on the "Chinese members of the MIT and greater academic community." The MIT GSU and MIT CSSA also encouraged individuals and organizations to sign the letter, which gathered a total of 1166 signatures.

In response to the open letter, Picard issued an amended statement on Dec. 18. Picard acknowledged that her talk's reference was an example of stereotyping, which was harmful for the Chinese community at MIT and for those belonging to the broader research community. "Our students and colleagues who are Chinese or Chinese American frequently contend with deliberate ethnic stereotyping that feeds an atmosphere of mistrust," Picard said. "That mistrust can lead to many kinds of problems, which in recent years have included outright discrimination and abuse."

The MIT Administration has not released a statement regarding Picard's remarks at the NeurIPS conference.

Search for suspect on campus concludes with arrest in Somerville

On Jan. 2 at 6:29 p.m., MIT alerted community members that police were searching campus for a suspect, specifically in the Main Group buildings around Massachusetts Avenue and Vassar Street. Although sightings ceased by 7:11 p.m., community members were still urged to "use vigilance/caution." The search fully concluded at 8:34 p.m.

Although MIT Alert did not name the suspect, local media reported that just after 6:30 p.m. on Jan. 3, Somerville Police arrested Fabio Armelio, 47. According to police records at the time of arrest, Armelio had 20 warrants from Somerville, Cambridge, Lawrence, and Boston, as well as MIT and Tufts. Armelio had previously been arrested on

May 18, 2024, on charges including drug possession, breaking and entering, and trespassing. In addition, police log articles in The Tech from 2010, 2011, and 2012 reported that Armelio, who is homeless, was arrested for reasons including trespassing, an outstanding warrant, and a default warrant.

Since Dec. 20, the Tufts/Somerville area has experienced 12 break-in incidents, including resident Anna Vicente finding a burglar in her hallway, which prompted the university to remind community members of safety measures.

Armelio's arraignment is scheduled for Jan. 6 in Somerville District Court.

—Sabine Chu

NOTES FROM A

HOPE(LESS/FUL)

ROMANTIC

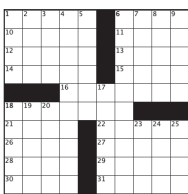
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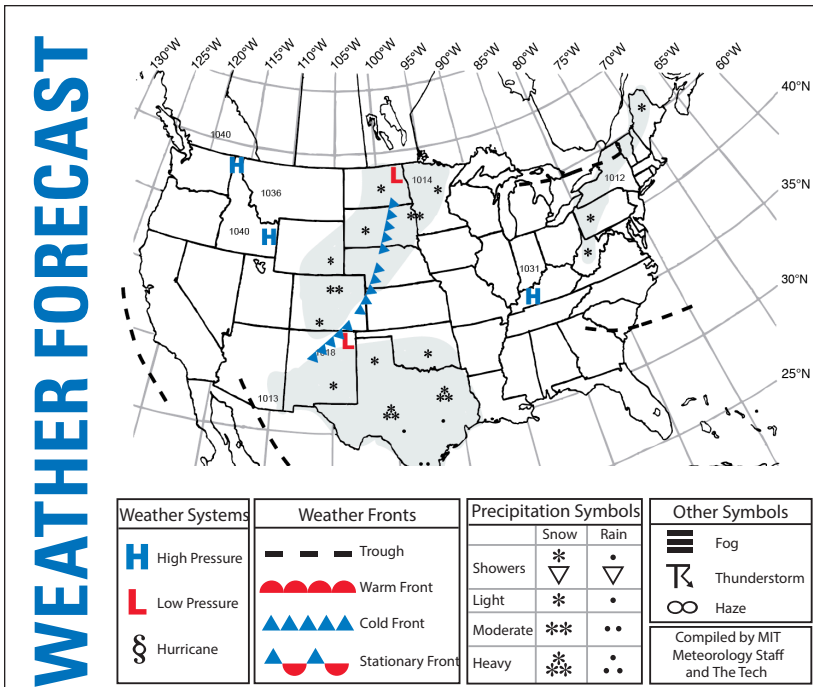
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West Coast vs East Coast: Fire vs. Ice

By Adrienne Lai
CHIEF METEOROLOGIST

The Boston Winter has arrived with the start of 2025! If the Fall semester weather convinced you that Boston Winters are not bad, let's see if that is true after IAP. Living up to the New England Weather expectations, brace yourself for chilling temperatures and forceful gusts of wind as temperatures drop to the 20s and wind speeds vary from 10-20 mph this week.

The snow storms hitting DC and the Mid-Atlantic are moving North, with a 20% chance of

snow today and a 50% chance on Saturday. If that precipitation is not snow, prepare for the freezing rain that makes IAP one of the worst times to be on campus. Now is the time to invest in that warm jacket, pair of gloves, hat, scarf, or whatever Winter gear you have your eye on.

While the East Coast freezes, the West Coast is heating up with wildfires sweeping across the Pacific Palisades in L.A. High speed wind gusts are spreading the fire quickly and taking out power lines. For those spending IAP there, stay safe!

JANUARY 9 SITUATION FOR NOON (ET)

Extended Forecast

Today: 20% of snow with a high of 29°F (-1.5°C). Wind chills can reach as low as zero with West winds of 20 mph.

Tonight: Clear skies with Northwest winds 21 mph. Low of 24°F (-4.5°C).

Friday: Sunny with a high of 38°F (3.0°C). Northwest winds 14 mph.

Saturday: 50% chance of snow during the day with a high of 33°F (0.5°C) and a low of 26°F (-3.5°C). West winds of 7 mph.

Sunday: Northwest winds of 10 mph with sunny skies. High of 37°F (3.0°C) and a low of 24°F (-4.5°C)

MIT admits 721 students to the Class of 2029

Acceptance rate increases from 5.3% to 6.0%

By Vivian Hir
EXECUTIVE EDITOR

On Dec. 17, MIT admitted 721 students to the Class of 2029 out of 12,053 students who applied early, which is an acceptance rate of 6.0%. 7,486 applicants were deferred, 3,039 were rejected, and 807 withdrew their applications. The number of early applicants had a slight decline from 12,563 last year to 12,053 this year, equivalent to a 4.1% decrease.

The Class of 2029 early action acceptance rate is an increase from the previous year, as the Class of 2028 had an early action acceptance rate of 5.3%. The number of accepted students also increased, from 661 in the Class of 2028 to 721 in the Class of 2029. MIT also admitted 100 students through the QuestBridge program, a significant increase from 56 in the prior application cycle. This number has been confirmed with Stu Schmill '86, Dean of Admissions and Student Financial Services.

For the Class of 2029, MIT Admissions increased targeted recruitment to reach more students from underrepresented backgrounds. "Given the results of the process last year, the first since the Supreme Court decision banning race conscious admissions, we expanded our

outreach program, especially in targeted ways," Schmill said in a written statement to The Tech.

In his blog article published on Aug. 21, 2024, Schmill noted that the Class of 2028 had a significantly lower proportion of students from "historically underrepresented racial and ethnic backgrounds" compared to the average for the classes of 2024-2027. Besides MIT Admissions' participation in the Small Town and Rural Students (STARS) College Network and Questbridge, MIT Admissions also increased the number of high school visits and program attendance across the country.

Unlike previous application cycles, this year's application had a new essay prompt asking students to write about a time when they did "something different than what was expected" in their educational journey. This question replaced the prompt that asked students to "describe the world you come from," and "how has that world shaped your dream and aspirations." According to Schmill, the reason for introducing this new essay prompt was wanting to "learn as much as we can about a student's background and context."

The Tech had the opportunity to interview students who were recently admitted to MIT's Class of 2029.

Shelly Yang from Reno, Nevada, was surprised when she saw confetti on the screen. "I was not expecting that at all," Yang said. "I ended up crying, which is ironic because I was like 'I'm not going to cry.'"

Aprameya Tripathy from Princeton, New Jersey, started reloading the application portal 10 minutes before 6:28 p.m. to check for an update, and recorded his reaction with his parents in the room. "Four minutes earlier at 6:24 p.m., I saw something that said 'there is an update to your admission,'" Tripathy said. "As soon as I opened it, I just said, 'Oh my God,' and I screamed."

Overall, the interviewed students enjoyed MIT's unique application and essay prompts; while other peer institutions like Harvard and Stanford use the Common Application, MIT does not use the Common Application. "I really liked the 'what do you do for fun' essay," Rohan Dhillion from Seattle said. "I think it's great to know whether students do something for fun because I feel like everyone should and everyone does."

Joshua Placides from Rockland, Maine, appreciated the MIT application activities section for its conciseness, as the section is limited to at most four activities. The Common

Application accepts up to 10 activities. "I was caught off guard, but in the long run it is better because it captures a better image instead of surrounded by noise," Placides said. "Why would I want to include this one extracurricular for say extracurricular number 10 that I barely even do or care about?"

Although admits have until May 1, 2025, to commit to MIT, all expressed interest in attending MIT because of MIT's academics and research opportunities as well as the community. Luna Avolio, a prospective Course 18 major from Goleta, California, looks forward to the classes at MIT, some of which she saw on Open Courseware. Avolio said, "All the MIT professors that I've seen there [OCW] have been so cool and the classes look like so much fun."

Vishal Surya, a prospective pre-med student from Katy, Texas, is excited about the life science research that happens at MIT, in particular the Broad Institute and Whitehead Institute. "Being part of an atmosphere where a lot of academic excellence is being cultivated is something that excites me a lot," Surya said.

The MIT regular action deadline was Jan. 6, and the decision release date for deferred and regular decision applicants is Mar. 14, 2025.

Rick Locke PhD '89 appointed next dean of MIT Sloan

On Monday, Jan. 6, Richard "Rick" Locke PhD '89 was officially appointed the next dean of the MIT Sloan School of Management. After earning his PhD in political science at MIT and serving the institute in various roles from then until 2013, he is returning to MIT as the 10th John C. Head III Dean of Sloan, effective July 1.

Locke has led a successful career with leadership positions in both academia and industry. After earning his PhD at MIT, he joined the MIT faculty as a professor of political science and management, and later became the head of the Department of Political Science. He served as MIT Sloan's deputy dean for several years, where he co-founded MIT's Global Entrepreneurship Lab (G-

Lab), an initiative which educates students through classes and internship opportunities at startups abroad.

After MIT, Locke served as provost of Brown University for seven and a half years before becoming dean of Apple University in 2023, an educational initiative for the company's employees. He is also heavily involved in research and has authored or co-authored five books and multitudes of journal articles on political science.

He succeeds interim dean Georgia Perakis and former dean David Schmittein. "Now as dean, I look forward to once again being part of this wonderful community," Locke says.

— Lucy Cai

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AN ELLIE FOR YOUR THOUGHTS

Notes from a Hope(less/ful) Romantic

Thoughts about love and life to mark the end of 2024.

By Ellie Montemayor
PUBLISHER

A Note from Ellie: All sections were written in the last week of December 2024 and the first week of January 2024, and are reflective of my situations, thoughts, and feelings up until that time. All names have been concatenated or otherwise replaced with alternate identifiers to preserve individuals' privacy. Details of individual situations are kept vague to focus more on my thoughts and feelings thereof.

"For what it's worth, I think for most the act of writing or creating from a dark place is just as cathartic and reconciliatory to one's self and others as it can be devastating."
— Em

December 24th
Dear Em*,

And we're back at it again. You popped out of my life as quickly as you entered it, all over again. I'm not sure whether to be displeased, distraught, dumbfounded, or disappointed—but you know me; you know I could never. You know I could never look at you, think of you, dream of you as anything other than perfect.

We found each other again with fall semester on the horizon, way back in August. And I fell in love with you all over again. I fell hard, like I did the last time I texted you first. Like each time I would text you first.

August 3rd, 10:57 PM: "hi," Ellie texted.

August 4th, 12:25 PM: "Hey," Em texted back.

And the pair talked for hours that day, and every day for the next week.

Thousands of thoughts are running through my mind right now. That first day back, the things you said to me (*You're such a wonderful person, a light, and you'll never be able to fully see that. It's more than I ever deserved, and I found myself incredibly grateful and fortunate to have found that in my life, even if I inevitably pushed it away*) and the things I said to you (*I never resented you for all of this in the first place. This is the first time we've talked in almost half a year, and my first and foremost thought is: I'm glad you're okay*) and all the things we talked about in that first week redux.

It was... well, how can I describe it as anything other than just lovely? Purely, simply, really entirely truly perfectly utterly lovely. When we texted, even though I was a hundred miles away from you, it felt like we were exploring the wonders of the universe together all over again. Talking about Robert Oppenheimer and the concept of the internal monologue and the Lovcraftian Outer Gods and moth arms and caffeine addictions and psychoacoustics and trans-humanism and industrialist worldly distractions and—

When we had our first conversations all over again, I found myself wanting more. But I wasn't sure whether you did too. "I'm scared that this is the end of our story," I told myself.

"I'm glad I found closure," I said to myself when I thought about what happened all those months apart, "but I don't want this to be the end of our story."

I know now that you found yourself wanting more too. You wanted me back just as much as I wanted you back. It wasn't the end of our story.

August 4th, 4:27 PM: "Sometimes time doesn't feel real," Em texted. "I know it's been a while, feels like a lifetime and also not so far ago."

Time doesn't ever feel real, does it? I've loved you for over a year by now, and it has been an all-consuming year. Not necessarily in a bad way. Never in the bad way, when it comes to you. Sometimes it feels as if I just met you, and others it feels as if I've known you forever. At all times, it feels like it was always meant to be that I ever got to know you.

Em, my love, what happened to us? What happened to "I'll always be here with you"?

I had the worst weeks of my life this month, and you weren't there. Everything was up and down and sideways the moment you walked away all over again, just like last time, and you weren't there for me to tell me that it would all be okay. I would ask for you, always you, in my worst moments, crying and screaming at the ceiling and begging for you to come back to me. Begging for my heart to feel complete again. Begging, begging, begging for the kind of love I needed from you, only you—the kind of love that perhaps you never could give me.

Maybe you never were there for me, and maybe you never could tell me that it would all be okay. Maybe it was all in my head, or maybe I don't know you like I used to. Maybe I never did.

You left a hairpin in my room, the last time you stayed the night. I kept it on my television stand, and each time I see it, I have to stifle a sob. You left traces of you in my room, in my thoughts, in my heart, and each time I try to live a little, I break apart. It's only been another three weeks, I would say to myself, of radio silence. But three weeks is enough to kill me all over again. I find myself breaking apart all over again.

I remember when you first came into my room here in my new house, way back in September. It felt like the first time I brought you into my little McCormick Hall single, except with a whole year's worth of love and emotions flooding into my heart. We spent the night talking and watching shows and listening to music. "If I could begin to be," we sang together, "half of what you mean to me." "I could do about anything," I said, with love in my eyes; "I could even learn how to love," you said, with love in yours.

When you come back—if you come back—I probably won't want to talk about what happened in those weeks you were gone. I don't want to do that to you, like I did the last time when you left, making you feel guilty as if you did everything wrong.

August 4th, 4:29 PM: "I just hold a lot of regrets, and uh fears I guess," Em texted. "I wish I made different decisions, but we can't go back."

I don't think of myself as innocent in all of this.

I know I pushed you away, too, because I knew I expected too much from you. You told me so yourself. "My feelings about you are complicated," you told me. I understand that completely. I know that I put so much burden on you that at times it might feel too much to bear.

I asked you to be the kind of person you weren't. I tried to mold you into my perfect vision of what I wanted this relationship to be, rather than accepting you as you are; as I should have; as is what you deserved.

Perhaps you deserve better than me. Perhaps you deserve someone who could really, truly love you as you are, and who would never ask for anything more than that. Someone who you could really explore the wonders of the universe with, like we tried to do together. Better than how we tried to do together. Better than me.

(I still want to try to be that person for you. Always for you.)

August 4th, 4:31 PM: "I don't want things to be about me, not again," Em texted. "I want to take responsibility."

I don't know whether to say goodbye to you, oh my lovely first planet from the Sun, my atomic number 80, my messenger of the gods.

Whatever you decide—whether you choose to love me again or whether you choose not to—I will always be on your side, always give you my blessing, and always tell you that it will all be okay. (Not that you need me to be, not that you need me to give it, and not that you need me to tell you that.)

But know that I'll always be yours, whether you decide that you want to come back to me again or not. And you'll always be in my heart and in my thoughts. You'll always be a part of me, oh lovely little blue-haired girl who always made my day. (See: I Saw a Stranger on the Street Today, another column from "An Ellie For Your Thoughts.") And the next time you walk in and out of my life again, if there is another next time, I'll say a loving goodbye to you all over again.

You were a love found and lost all over again. Loving you was the biggest mistake I've ever made. And I'd make that mistake all over again, every single time, in every single universe.

December 3rd, 10:40 PM: "i'm trying to get my shit together and i want us to figure this out, if that's okay," Ellie texted. "i don't really know what you need right now."

December 8th, 5:44 AM: "hey uh i know youre busy," Ellie texted. "i just wanted to like, um, i just wanted to see how you were doing."

December 12th, 2:04 AM: "was just listening to a song that reminded me of you," Ellie texted. "and just wanted to say hi after that."

December 23rd, 12:28 PM: "i feel like i'm going crazy," Ellie texted. "if you don't want to do this anymore, please just give me a text."

January 5th
Dear Red*,

When we had our first kiss, it was electrifying. When we had our second, it was exhilarating. When we had our third, it was intoxicating.

And our fourth, fifth, sixth, and all the rest—they're all quite animating.

I don't know what to say to you here except that I quite like you, and I know that you quite like me, too. I already wrote you a letter penned on paper that you read and quite liked.

I do wish, and I know I already told you this, that we spent more time together. There's always a stolen kiss or two here and there, but I suppose I can be quite covetous in wanting more. It's the story of my life, isn't it? The idea of "wanting more," never being quite happy with what I have now.

Perhaps you're the universe's great answer to my great question. Perhaps you're my next great challenge in learning to be content.

But I still want to know: what does our future look like? Do you want to be more than what we are? Should we be more than what we are? (What even are we? Friends? More than that? Less than that? Exactly just that?)

Red, are you my next great love or just another fixation?

December 23rd
Dear Rose*,

We had a conversation earlier today about this: "I don't want there to be expectations," you said.

"Okay," I said. "Then how about this? I will only ever do what is comfortable for you. We'll only ever do what works for you."

"Okay," you said.

"And whenever it comes up, you tell me what you want, and we'll do that. And when you don't, then we won't."

"Okay."

My question for you: what am I supposed to make of what we are when it's nothing but something but nothing at all?

January 2nd
Dear Cat*,

I'm sorry.

I don't know what we had, and I don't know what it was, but I'm sorry we had to lose it. We had left it unlabelled the whole time, not by my choice but with my assent, nonetheless.

I ended this because I needed to.

What you wanted out of "us" was never the same as what I wanted, was it? You wanted something nice and simple, and I always want everything to be all too complex. I can't always just ignore my emotions and pretend to be okay around

you the way I thought you needed me to. (You told me in the end that you had never wanted me to mask it all away; but I knew that in the end it would have scared you off anyway.)

I have good times, and I have bad times. You know that. I have *really* good times, and I have *really* bad times. You also know that. This past semester, I think the only times I've ever really spent time with you—really *wanted* to spend time with you—were in my bad ones. And when we had our good ones, they only really felt good for me because I was having my bad ones and I would need to wash it all away with anything. That *anything* always ended up being you, and I hated doing that to you.

I hadn't liked how we interacted for a long time. At times, I felt like I was avoiding you just to keep the pretense that all was well. (If I didn't interact with you, I said to myself, I wouldn't have to hate interacting with you.) I wanted to hear about you and your day; I wanted you to let me talk about my days, the many goods and the many bads; I wanted us to be vulnerable with each other in a way that you never could.

But that's okay. It's okay that we weren't able to make it work.

Because we still have the memories. Can that be enough for us?

A different version of me would have been able to make this work, I know that. Because a different version of me wouldn't be fundamentally different from that different version of you in the way that this version of me is with this version of you.

"In another life, we would have been good for each other," I said, tears in my eyes. You nodded, tears in yours.

December 25th

Dear Em*,

You know what? *I am* angry.

I'm displeased at how you walked all over me and walked away all over again.

I'm distraught that nothing has changed.

I'm dumbfounded by our futile attempts to make ourselves change.

I'm disappointed that we failed.

And I'm angry that I ever thought we were better than this—that we would be better than we were.

I'm feeling a lot of things right now, and I'm not going to deny them anymore. I'm so angry at you, and I'm so angry at myself, and I don't know how to say it in any other way than that.

"I'll always be here with you," you said to me when we saw each other again for the first time in over half a year. What happened to that? (Was it just another lie?)

Every single person I know has told me to let you go. I'll never fucking listen to them, you know that; I'll only ever listen to you.

I'll never let you go unless you tell me to. I care about you too much—and I hate myself too much—to do it myself.

Get a better girlfriend, Ellie, they tell me. *One who treats you better*. And my only response: *I love her too much*. I don't, at times, have any other response than that. Most days I tell myself that's the only justification I need. But sometimes I question whether all of this is worth it.

I know it should be, and I know I want it to be, but I know it isn't.

Maybe it's falling apart because, deep inside, we want it to. Maybe both of us think that we don't deserve this. I wish I didn't believe myself when I say that, and I'm sorry I do. I have complicated feelings about you, too.

Because I love you so much.

And I hate you for that—for making me love you so much to and past the point of pain and hurt. I hate you because I know that the next time you walk into my life, we'll just play this game all over again. You just go in and out like I'm a goddamn revolving door. And I just let it happen. And I know I'll just let it happen all over again, every single time, in every single universe.

"Love doesn't look like this. It's supposed to feel better than this, isn't it?"
— Ani Mikheeva, *Anora* (2024)

WORLD & NATION is a two-page column featuring news articles syndicated from a selection of major newspaper outlets, covering topics of public interest and critical information which extend beyond the bounds of *The Tech's* coverage as centered around the MIT and local community. Ownership of syndicated content is retained under their original respective publications, and is republished in this format to serve as an easily-accessible, printed digest for *The Tech's* readership.

The column consists of two pages, with Side A focused on US news and politics and Side B on topics of international concern. The articles featured here are abridged as to contain only their most essential points; readers are directed to read more about an article from its original publication.

Net neutrality rules struck down by appeals court

A federal appeals court struck down the Federal Communications Commission's landmark net neutrality rules on Thursday, ending a nearly two-decade effort to regulate broadband internet providers as utilities.

The U.S. Court of Appeals for the Sixth Circuit, in Cincinnati, said the F.C.C. lacked the authority to reinstate rules that prevented broadband providers from slowing or blocking access to internet content. In its opinion, a three-judge panel pointed to a Supreme Court decision in June, known as *Loper Bright*, that overturned a 1984 legal precedent that gave deference to government agencies on regulations.

— Cecilia Kang, FROM THE NEW YORK TIMES
ORIGINALLY PUBLISHED JANUARY 2, 2025

Biden bans new oil and gas drilling along most U.S. coasts

President Biden announced on Monday what he called a permanent stop to new oil and gas drilling across more than 625 million acres of U.S. coastal waters, saying he was making the move because drilling posed unnecessary risks to the environment, public health and the coastal communities' economies.

The ban is part of an effort to fortify Mr. Biden's environmental legacy in ways that some experts believe could not be quickly reversed by President-elect Donald J. Trump, who has heavy support from the oil and gas industry and has promised to expand drilling. Mr. Biden also intends on Tuesday to announce two new national monuments in California.

— Lisa Friedman, FROM THE NEW YORK TIMES
ORIGINALLY PUBLISHED JANUARY 6, 2025

Appeals court refuses to delay Trump sentencing in hush-money case

A New York appeals court has denied Donald Trump's 11th-hour bid to delay his Friday sentencing in his felony hush money case. Lawyers for the president-elect sought to overrule the lower court judge over-seeing the case who had ordered Trump to appear for sentencing on 10 January.

The appeals court issued its decision just minutes after holding an emergency hearing on Tuesday. Earlier this week, Justice Juan Merchan said the sentencing would proceed as Trump's arguments against it "are for the most part, a repetition of the arguments he has raised numerous times in the past."

— Kayla Epstein, FROM BBC
ORIGINALLY PUBLISHED JANUARY 7, 2025

Judge in Trump's classified docs case temporarily blocks release of special counsel's final report

The judge in President-elect Donald Trump's classified documents case on Tuesday temporarily blocked the release of special counsel Jack Smith's final report in an attempt to prevent "irreparable harm" while the matter is considered by the Eleventh Circuit Court of Appeals.

The move came a day after Trump's former co-defendants, Walt Nauta and Carlos De Oliveira, asked U.S. District Judge Aileen Cannon -- who dismissed the classified documents case in July after deeming Smith's appointment unconstitutional -- to issue an order barring Attorney General Merrick Garland from publicly releasing the report.

— Katherine Faulders, Peter Charamaloulos, Pierre Thomas, & Alexander Mallin, FROM ABC NEWS
ORIGINALLY PUBLISHED JANUARY 7, 2025

North Carolina Supreme Court may decide a Supreme Court election

The Election Day vote count and two subsequent recounts all concluded that Justice Allison Riggs, the Democratic incumbent, narrowly won her race for a seat on the North Carolina Supreme Court.

But on Tuesday that same Supreme Court, which is controlled by Republicans, blocked state officials at least temporarily from certifying that outcome. That set the stage for an extraordinary challenge to the results by the Republican in the contest, Judge Jefferson Griffin of the state Court of Appeals. The court said it would hear the case later this month. Judge Griffin is asking the court to remove from the results tens of thousands of ballots that were submitted by mail, and to order state officials to provide a correct count.

— Michael Wines, FROM THE NEW YORK TIMES
ORIGINALLY PUBLISHED JANUARY 7, 2025

As L.A. burns, Trump blames Newsom, who pushes back

Hannah Knowles, Brianna Tucker, & Marianne LeVine
FROM THE WASHINGTON POST
ORIGINALLY PUBLISHED JANUARY 8, 2025

President-elect Donald Trump and California Gov. Gavin Newsom clashed Wednesday over fires burning out of control in the Los Angeles area, injecting national politics into a growing crisis in the city that Vice President Kamala Harris calls home and that President Joe Biden was visiting for the birth of his great-grandson.

During a news conference Tuesday, Newsom had urged Trump not to "play any politics" during the "precious moments that we have to evacuate."

But as the fires forced tens of thousands of people to leave their homes and left at least five dead Wednesday, Trump sought to pin the catastrophe on Democratic governance, blaming Newsom's water management decisions for the fires — an idea that water experts strongly disputed — and

noting that some fire hydrants had run dry amid huge demand.

"A true disaster!" Trump wrote in a post on his social network, Truth Social.

The president-elect's attacks on Newsom echoed the feuds over disaster response that marked his first term and signaled that he will continue to eagerly criticize Democratic officials during natural disasters in their jurisdictions. Trump also blamed Newsom for wildfires during his first term, suggesting that California should have "raked" its forests better.

At the time, Newsom criticized Trump's skepticism of climate change, which has exacerbated the frequency and severity of many natural disasters, including wildfires.

On the campaign trail this year, Trump spread misinformation about the government response to Hurricane Helene and threatened to withhold federal aid from California unless the state changed how it manages water.

Trump's comments Wednesday took a similar tone. He wrote on Truth Social that Newsom had refused to sign a "water restoration declaration" that would have diverted more water to the region. A Newsom spokesperson responded that no such document existed and said that the governor is "focused on protecting people, not playing politics, and making sure firefighters have all the resources they need."

Asked to elaborate on Trump's charges, Trump spokeswoman Karoline Leavitt pointed to a 2020 memorandum he signed meant to direct more water to Southern and Central California. California sued to block that effort, arguing that it could harm endangered species and was not scientifically justified.

Trump's contention that Newsom's water management decisions were to blame for the severity of the fires is not supported by the facts, multiple water experts told *The Washington Post*.

Trump imagines new sphere of U.S. influence

Vivian Salama & Alexander Ward
FROM WALL STREET JOURNAL
ORIGINALLY PUBLISHED JANUARY 7, 2025

President-elect Donald Trump's calls to take control of Greenland, Canada and the Panama Canal reflect his fascination with a 21st-century version of an old idea—that great powers should carve out spheres of influence and defend their economic and security interests by imposing their will on smaller neighbors.

In a press conference Tuesday, Trump outlined a second-term foreign policy agenda that rests not on global alliances and free trade but on economic coercion and unilateral military might, even against allies.

With the Panama Canal and Greenland, he suggested he could use force to take them over. With Canada, he suggested he would hit the U.S.'s northern neighbor with extreme tariffs, leav-

ing it no choice but to submit to annexation.

"Canada and the United States, that would really be something," Trump said. "You get rid of that artificially drawn line and you take a look at what that looks like and it would also be much better for national security."

Taking control of Greenland, Canada, and the Panama Canal through military or economic force would be a dramatic departure from decades of U.S. foreign policy as pursued by presidents of both parties. If Trump does even a portion of what he described—each of which is extremely unlikely—it could mean far-reaching changes in America's global role, emboldening adversaries and forcing allies no longer assured of Washington's backing to seek new security and economic arrangements, analysts said.

For Trump, the case for a sweeping reorientation of foreign policy rests on a stew of long-espoused and even conflicting

convictions—that even close allies are treating the U.S. unfairly, that America gave away the canal to Panama for nothing, and that China is moving into what should be the U.S.-dominated Western Hemisphere.

Asked by a reporter if he would commit to not using military force or economic pressure in his quest to acquire the territories, Trump replied "No, I can't assure you on either of those two. But I can say this, we need them for economic security."

Trump's willingness to broach such ideas and his disregard for bipartisan doctrines left some aghast.

"We just haven't seen anything like this, at least in my lifetime, from a president of the United States," said Chuck Hagel, the former Republican senator and defense secretary during the Obama administration. "This is very, very autocratic, and that is why it is so concerning what Trump is saying and how he's acting."

Pacific Palisades wildfire kicks up across Los Angeles

Jaimie Ding, Janie Har, & Julie Watson
FROM ASSOCIATED PRESS
ORIGINALLY PUBLISHED JANUARY 7, 2025

A wildfire whipped up by extreme winds swept through a Los Angeles hillside dotted with celebrity residences Tuesday, burning homes and forcing the evacuation of tens of thousands of people, some of whom abandoned their cars and fled on foot to safety with roads blocked.

California Gov. Gavin Newsom, who was in Southern California to attend the naming of a national monument by President Joe Biden, made a detour to the canyon to see "firsthand the impact of these swirling winds and the embers," and he said he found "not a few — many structures already destroyed."

Officials did not give an exact number of structures damaged or destroyed in the Pacific Palisades wildfire, but they said about 30,000 residents are under evacuation orders and more than 13,000 structures were under threat.

And the worst could be yet to come. The blaze began around 10:30 a.m., shortly after the start of a Santa Ana windstorm that the National Weather service warned could be "life threatening" and the strongest to hit Southern California in more than a decade. The exact cause of the fire was unknown and no injuries had been reported, officials said.

The winds were expected to increase overnight and continue for days, producing isolated gusts that could top 100 mph (160 kph) in mountains and foothills — including in areas that haven't seen substantial rain in months.

"By no stretch of the imagination are we out of the woods," Newsom warned residents, saying the worst of the winds are expected between 10 p.m. Tuesday and 5 a.m. Wednesday. He declared a state of emergency on Tuesday.

As of Tuesday evening, 28,300 households were without power due to the strong winds, according to the mayor's office. About 15,000 utility customers in Southern Cali-

Israeli soldiers abroad are being investigated for war crimes

Amanda Taub
FROM THE NEW YORK TIMES
ORIGINALLY PUBLISHED JANUARY 8, 2025

An Israeli reservist left Brazil in a hurry this week after a Brazilian judge ordered an investigation into whether he committed war crimes in Gaza.

Israeli consular officials helped the soldier, Yuval Vagdani, fly out of the country on Sunday after the order became public. It was prompted by a criminal complaint filed by a Belgium-based non-profit group, the Hind Rajab Foundation, which "focuses on offensive legal action against perpetrators, accomplices, and inciters of war crimes and crimes against humanity in Palestine."

On Wednesday, the Israeli military announced that it would no longer identify soldiers by name in the media, "fearing the arrest of soldiers abroad."

Mr. Vagdani was deployed in Gaza after the Oct. 7, 2023 attacks by Hamas, which triggered Israel's

invasion of the territory in a campaign aimed at defeating and destroying Hamas.

According to the Hind Rajab Foundation complaint, Mr. Vagdani posted videos and photos to social media from Gaza showing that he had destroyed civilian homes and other buildings. The group claims those actions were a systematic attempt to impose unbearable living conditions on the civilian population, in violation of international law. (The Times has not independently verified that evidence.)

A Brazilian judge determined that the allegations should be investigated, and referred the matter to the federal police. Several similar criminal complaints have been filed against vacationing Israeli soldiers in recent months, including in Cyprus, Sri Lanka, Argentina and Chile.

Mr. Vagdani, whom the Times was unable to reach for comment, arrived in Israel on Wednesday.

In an interview with Kan, Is-

rael's public broadcaster, he acknowledged posting the video of a building being blown up. "That's what they saw and wanted to investigate me about," he said. "They turned it from one house into 500 pages, they thought I'd murdered thousands of children and who knows what."

Mr. Vagdani also told Kan he was at the Nova music festival near the Gaza border on Oct. 7, 2023 and escaped the massacre there.

Israeli officials downplayed the seriousness of the cases, noting that none of the criminal complaints had led to arrests. "We understand that part of this phenomenon is driven by pro-Palestinian activists and based on open source intelligence," said Lt. Col. Nadav Shoshani, a spokesman for the Israeli military.

The open source methods in question are social media posts, which pro-Palestinian groups are now using as evidence to request criminal charges against the soldiers when they travel abroad.

Sudanese paramilitary group committed genocide, U.S. says

Declan Walsh
FROM THE NEW YORK TIMES
ORIGINALLY PUBLISHED JANUARY 7, 2025

The United States on Tuesday accused a Sudanese paramilitary group and its proxies of committing genocide, singling them out in a conflict of unchecked brutality and drawing fresh attention to the scale of atrocities being perpetrated in Africa's largest war.

Secretary of State Antony J. Blinken said the Rapid Support Forces, the paramilitary group fighting against Sudan's military had committed acts of genocide, including a fearsome wave of ethnically targeted violence in the western region of Darfur.

The Treasury Department backed the determination of genocide with a raft of sanctions targeting the R.S.F.'s leader, Gen. Mohamed Hamdan, as well as seven companies in the United Arab Emirates, the group's main foreign sponsor, that have traded in weapons and gold on his behalf.

"The R.S.F. and allied militias have systematically murdered men and boys — even infants — on an ethnic basis, and deliberately targeted women and girls from certain ethnic groups for rape and other forms of brutal sexual violence," Mr. Blinken said in a statement. "Those same militias have targeted fleeing civilians, murdering innocent people escaping conflict, and prevented remaining civilians from accessing lifesaving supplies."

The genocide determination comes two decades after the United States took a similar step in 2004, when then-Secretary of State Colin Powell determined that the Janjaweed, ruthless ethnic militias allied with Sudan's military, had committed genocide during a vicious counterinsurgency campaign in Darfur.

The Janjaweed later morphed into the Rapid Support Forces. But instead of being allied with Sudan's military, the group is now fighting it, in a civil war that has driven one of Africa's largest countries into a dev-

astating famine, killed tens of thousands of people and forced more than 11 million people — almost one-quarter of Sudan's population — to flee their homes, according to the United Nations.

Atrocities and war crimes have been committed on both sides, say officials from the United States, the United Nations and human rights groups. The military has repeatedly massacred civilians in indiscriminate bombing raids, sometimes killing dozens at once.

But only the R.S.F. has been accused of ethnic cleansing, particularly during a systematic violence in Darfur between April 2023 — when the civil war began — and November of that year. Its fighters, who are mostly ethnic Arabs, targeted members of the Masalit, a non-Arab ethnic group, in a brutal assault that became a central element of the American genocide determination, said two senior U.S. officials who spoke on condition of anonymity to discuss sensitive diplomatic matters.

Canada's embattled PM Justin Trudeau announces resignation

Astha Rajvanshi & Mima Alsharif
FROM NBC NEWS
ORIGINALLY PUBLISHED JANUARY 6, 2025

Justin Trudeau said Monday that he will resign as the leader of Canada's ruling Liberal Party, an announcement that will fire the starting gun on a contest to replace him as prime minister.

Trudeau said it was clear that he could not "be the leader during the next elections due to internal battles," later citing polarization inside and outside the country.

"I intend to resign as party leader, as prime minister, after the party selects its next leader through a robust, nationwide competitive process," Trudeau told reporters in Ottawa. "Last night, I asked the president of the Liberal Party to begin that process."

The beleaguered prime minister's departure follows growing calls for his resignation from member of his own party, with the Liberals lagging behind the opposition Conservative Party in opinion polls

and internal battles raging over his handling of President-elect Donald Trump.

That pressure rose with the resignation of Deputy Prime Minister Chrystia Freeland last month. Freeland, who was also the finance minister, quit unexpectedly citing concerns over the Trudeau administration's relatively cooperative approach to the incoming Trump administration's plan to increase import tariffs on Canadian goods by 25%.

Front-runners to replace Trudeau include former and current finance ministers Freeland and Dominic LeBlanc, as well as Foreign Affairs Minister Mélanie Joly.

"For the past number of weeks, you and I have found ourselves at odds about the best path forward for Canada," Freeland said in her resignation letter, adding that the country can "ill afford" Trump's tariff threats.

The longtime Trudeau ally added that leaving the Cabinet was the only "honest and viable path."

During his remarks Monday,

Trudeau called Freeland "an incredible political partner" and said he had hoped she would stay on as deputy prime minister, "but she chose otherwise."

"In regards to what actually happened, I am not someone who's in the habit of sharing private conversations," Trudeau said about Freeland's resignation.

After Trudeau's announcement, Freeland took to X to thank the prime minister for his years of service.

"I wish him and his family the very best," Freeland wrote.

Trudeau, who swept to power in late 2015 and has governed for nine years, was once the most popular leader in the Group of Seven, the world's most advanced liberal economies.

But the party's popularity has declined rapidly against the opposition over the past year. The latest survey released Friday by the Canadian research firm Angus Reid found that voter support for the Liberals had sunk to an all-time low of 16%.

Tents arrive for survivors of a quake that killed 126 in freezing, high-altitude Tibet

Relief teams in western China shifted their focus to resettling survivors after a search Wednesday for any remaining victims of a deadly earthquake that struck a day earlier near a holy city for Tibetan Buddhists. Tents, quilts, stoves and other relief items were being delivered to people whose homes were uninhabitable or unsafe. State media said that more than 46,000 people had been relocated following the quake, which killed 126 and injured 188 others.

Tibetans, many of whom have fled persecution in China, held vigils for the victims in neighboring India and Nepal, both of which have sizeable communities.

— Ken Moritsugu & Christopher Bodeen, FROM ASSOCIATED PRESS
ORIGINALLY PUBLISHED JANUARY 8, 2025

South Korean authorities extend arrest warrant for embattled President Yoon Suk Yeol

South Korean authorities have granted a request to extend a warrant to detain the country's suspended President Yoon Suk Yeol for questioning over his surprise declaration of martial law last month. The warrant expired on Monday at midnight (10 a.m. ET) but was reissued on Tuesday afternoon local time by Seoul Western District Court at the request of the Corruption Investigation Office (CIO). The deadline for the warrant has not been disclosed.

— Gawon Bae, Yoonjung Seo, Simone McCarthy & Lauren Said-Moorhouse, FROM CNN
ORIGINALLY PUBLISHED JANUARY 7, 2025

Pakistan and Afghanistan tensions escalate amid border clashes

When Kabul fell to the Afghan Taliban in 2021, the head of Pakistan's intelligence service was one of the first foreign guests to visit the new regime, telling reporters that "everything will be okay." But less than 3½ years later, relations between Pakistan and Afghanistan have dramatically deteriorated.

In the most severe confrontation between the countries so far, Pakistani airstrikes killed 46 people in eastern Afghanistan in late December, according to the Afghan government. Pakistani officials said the strikes targeted militants of the Pakistani Taliban. The Afghan government said women and children were among the victims of the strikes.

— Rick Noack, Haq Nawaz Khan & Shaïq Hussain, FROM THE WASHINGTON POST
ORIGINALLY PUBLISHED JANUARY 8, 2025

North Korea fired hypersonic missile in message to 'rivals,' Kim Jong Un says

North Korea's state-run Korean Central News Agency on Tuesday claimed a successful test of a new type of intermediate-range hypersonic ballistic missile, with leader Kim Jong Un touting the weapon as a major military achievement.

KCNA said the successful test took place on Monday. The launch marked Pyongyang's first missile test of 2025 and came with Secretary of State Antony Blinken in the region for what is expected to be his last foreign trip as America's top diplomat.

— David Brennan, FROM ABC NEWS
ORIGINALLY PUBLISHED JANUARY 7, 2025

A Russian missile attack in southern Ukraine has killed at least 13 civilians, officials say

A daytime Russian missile attack on the southern Ukraine city of Zaporizhzhia killed at least 13 civilians and injured about 30 others Wednesday, officials said. Footage posted on Ukrainian President Volodymyr Zelenskyy's Telegram channel showed civilians lying in a city street littered with debris. They were being treated by emergency services and taken away on gurneys.

Russian has frequently launched aerial attacks on civilian areas during the almost three-year war. Thousands of civilians have been killed in Europe's biggest conflict since World War II.

— Illia Novikov, FROM ORGANIZATION
ORIGINALLY PUBLISHED MONTH DAY, YEAR

Fate of U.N. Palestinian refugee agency in limbo as Israel readies ban

The U.N. agency that provides aid and services to millions of Palestinians across the Middle East may soon be forced to end its operations in the West Bank and Gaza Strip, as Israel prepares to enact twin laws banning the organization's work in Israeli territory and prohibiting contact between its staff and government officials.

The legislation, passed with near-unanimity by Israel's Knesset in October, is set to go into effect later this month. It could compel the United Nations Relief and Works Agency (UNRWA) to dismantle what is essentially a quasi-state in the Palestinian territories, built over generations to serve a growing population of refugees and their descendants.

— Ruby Mellen & Heidi Levine, FROM THE WASHINGTON POST
ORIGINALLY PUBLISHED JANUARY 8, 2025

CRITIC'S NOTEBOOK

Arvo Pärt's *Spiegel im Spiegel* reflects like infinite mirrors

a piece true to its name

By Vivian Hir
EXECUTIVE EDITOR

One of my favorite musical pieces of all time is contemporary classical composer Arvo Pärt's *Spiegel im Spiegel*, which means "mirror(s) in the mirror" in German. I first listened to the piece when I watched the Boston Ballet perform Helen Pickett's *Tsukiyo* two years ago, a duet inspired by the Japanese fable of "The Woodcutter's Daughter" set to *Spiegel im Spiegel*. The intimate dance was so moving that I wrote about the experience in a previous article.

After watching the ballet performance, I had a brief obsession with *Spiegel im Spiegel* and searched up recordings of the piece and articles about its composer. Composed in 1978 for piano and violin, the piece was one of Pärt's last compositions before he left his homeland of Estonia.

True to its name, the composition resembles the infinite reflections of two mirrors facing each other: the piano's three-note accompaniment in the 6/4 time signature possesses a cyclical quality, with each note sounding like the tinkling of bells. At the same time, the violin's melody consists of dotted whole notes that take up the entire measure, which creates a sustained and stable sound. The main melodies repeat and reflect endlessly over the course of the piece, providing a sustained space for the listener to enter their own state of reflection.

While the piece's recurrent nature might come off as repetitive at first listen, it has a magical ability to stretch time to the point of infinity, creating an indescribable draw. By doing so, these components contribute to the piece's minimalistic sound, where periods of emptiness are just as important as the notes themselves.

What makes the musical arrangement of *Spiegel im Spiegel* compelling is how well the piano and violin complement each other. The piano stands out for its crystal-clear three-note melody and the periodic high dotted half notes that resemble sparkles of

light, serving as the piece's musical foundation. Meanwhile, the violin takes on a sweet, endearing melody, vibrato resulting in a trembling sound similar to a quavering voice of emotion. By varying the pitch ever so slightly, the vibrato also adds an element of vulnerability, causing the listening experience to be quite touching. When their sounds intertwine, the piano and violin act as inseparable dancers engaged in a stunning duet.

Although *Spiegel im Spiegel* does not have noticeable shifts in dynamics and melody, the piece somehow feels cathartic. At times, it evokes feelings of melancholy and sadness, especially the violin's melody in F major that slowly ascends and descends. The complex emotions that the composition captures, from yearning to introspection, allows it to have endless interpretations.

When I first heard *Spiegel im Spiegel*, I couldn't help but hear it as a representation for the cycle of life. The radiant beginning is the birth and youth, and the slow trudging to its inevitable end represents the person's last years. More recently, I have interpreted the piece as a tenacious hope that persists despite the silent struggle that fills our lives. I listened to it at the start of the new year, thinking back about the low points of 2024, but hopeful for a better year to come. Doing so felt like pressing life's reset button.

What has made me revisit *Spiegel im Spiegel* every so often is how the piece has been a source of comfort throughout my recent life, from experiencing solitude to coping with loss. I find it comforting because it is like a mirror, encouraging me to reflect and untangle my emotions, even if it can be uncomfortable at times. That is not to say that it is merely a sad piece: *Spiegel im Spiegel* is also incredibly meditative and illuminating.

Whatever emotions you experience when listening to this piece, *Spiegel im Spiegel* is a powerful reminder that even minimal music can be emotionally affecting and contemplative.

Sol. to Snack Time from page 7

1	S	P	A	M	S		6	C	A	S	T
10	W	I	K	I	A		11	O	N	M	E
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TECH's PICKS: ENTERTAINMENT THIS ISSUE

THURSDAY, JANUARY 9 – WEDNESDAY, JANUARY 22

FILM

BETTER MAN
(FRI, JAN 10)



THE LAST SHOWGIRL
(FRI, JAN 10)



FILM

ONE OF THEM DAYS
(FRI, JAN 17)



SEPTEMBER 5
(FRI, JAN 17)



TV

AMERICAN PRIMEVAL
(THU, JAN 9)



PRIME TARGET
(WED, JAN 22)



VIDEO GAMES

DYNASTY WARRIORS
(FRI, JAN 17)



ENDER MAGNOLIA
(WED, JAN 22)



Snack Time

by Manaal Mohammed '25
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30						31			

Across

- 01 Triple texts, perhaps
- 06 Play lineup
- 10 Former name of the Fandom hosting service
- 11 "I got it!"
- 12 Off kilter
- 13 Thor's father
- 14 Japanese breadcrumbs
- 15 Low-carb diet
- 16 Tough guy
- 18 Bridget Jones, for one
- 21 "Oh, sure"
- 22 Spew out
- 26 Shock
- 27 Quickly greet
- 28 Bollywood producer Kapoor
- 29 Whip
- 30 Tiny memory unit
- 31 Actor Davis

Down

- 01 Trade
- 02 Hummus go-with
- 03 Similar (to)
- 04 Dairy container
- 05 Zen Buddhist goal
- 06 You might be caught with your hands in them
- 07 Chocolate mint brand
- 08 Strike down, as in the Bible
- 09 Voice above baritone
- 17 Peace-promoting org.
- 18 Islamic headwear
- 19 Deep black
- 20 On again
- 23 Looks over
- 24 Masala ____
- 25 "Person of the Year" magazine

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Prince Charming
when you can
print charming
things?



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SCIENCE

Forging ahead in alloy design using machine learning

Predicting atomic behavior in advanced alloys paves the way for targeted material design.

By Jieruei Chang

In 3500 BC, a metalsmith in ancient Persia is smelting copper. He's made a mistake — the ore he's using is impure. When it comes out of the forge, the metal has strange properties. It is stronger than normal copper and easier to cast. The smith has discovered humanity's earliest alloy: arsenic bronze.

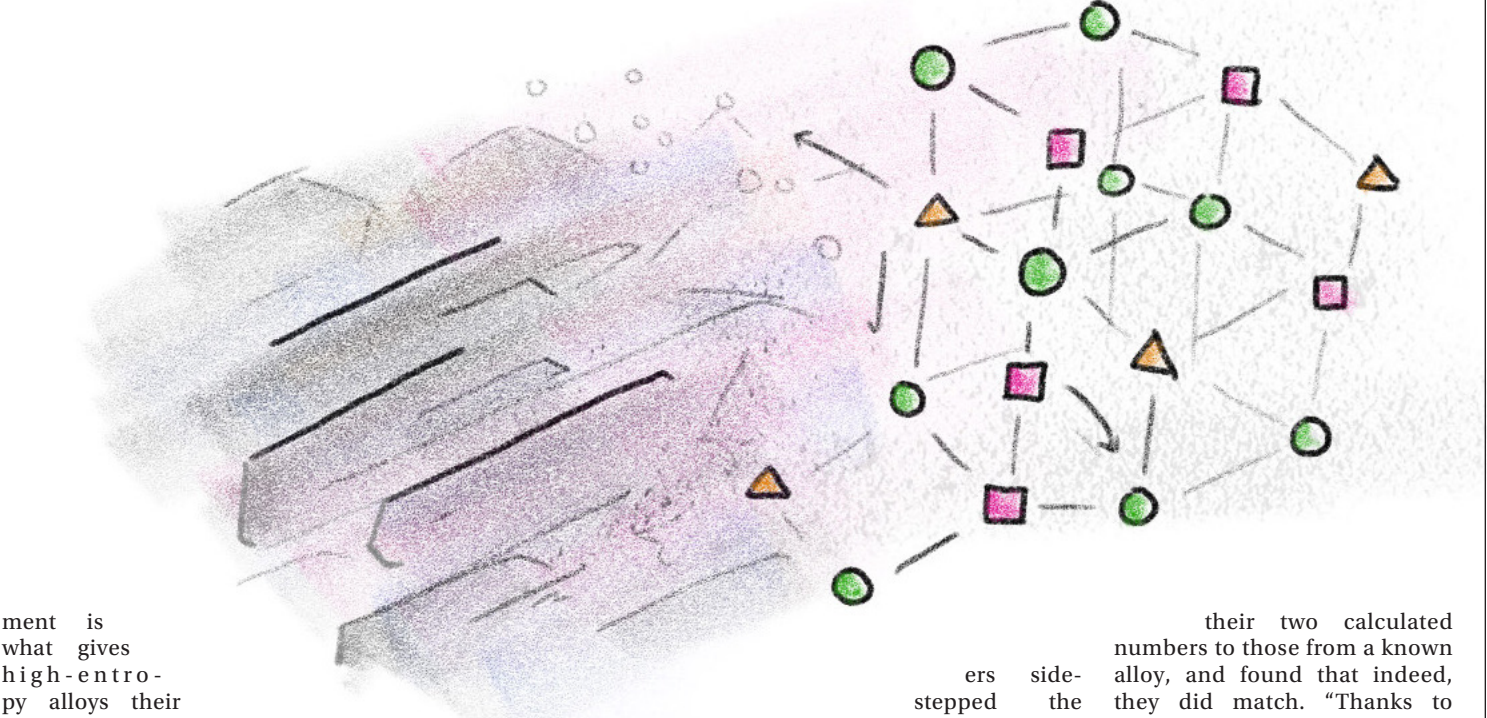
Mixing metals together often results in alloys with better properties than their constituent parts. But alloys today are almost always composed of one or two elements with small amounts of other substances mixed in. Bronze is 88% copper and 12% tin. Steel is 98% iron and 2% carbon. What would happen if many more metals were mixed together?

The answer lies in high-entropy alloys. Theorized in the 1980s and first synthesized in 2004, they are considered an entirely new class of material. High-entropy alloys are made of up to twenty different elements, mixed together in more even proportions. When they come out of the forge, they have unique properties. They're strong. Hard. Heat-resistant. Corrosion-resistant. High-entropy alloys are already starting to be used in aerospace, nuclear reactors, and biomedical devices.

However, they're hard to design: there are too many variables to tune. Trying all possible combinations experimentally is infeasible. Instead, researchers have been turning to computational models that simulate material systems starting from pure physics. In a paper published last June in *The Proceedings of the National Academy of Sciences*, researchers in MIT's Materials Science and Engineering (DMSE) and Electrical Engineering and Computer Science (EECS) departments used simulations with machine learning to predict how atoms arrange themselves in alloys.

"This work is making two messages: here's one way we could accurately simulate on a computer high-entropy materials, and here's how we could start making sense of the information that we have from atomistic simulations," says Killian Sheriff, PhD candidate in DMSE and the lead researcher on the work. Sheriff first became interested in high-entropy alloys while studying physics as an undergraduate. He speaks excitedly in a French accent, waving his hands in the air. Four times during our conversation, he runs to the whiteboard at the other side of the room and starts drawing diagrams.

Unlike most metals, high-entropy alloys have no clear repeating crystal structure. They appear to be haphazard lattices of atoms, like randomly colored balls in a ballpit; the apparent disorder in their atomic arrange-



ment is what gives high-entropy alloys their name. For a long time, people modeled these alloys as if their elements were randomly distributed. However, it turns out that atoms in a high-entropy alloy form small local patterns, called short-range order (SRO). Some of these local patterns appear a thousand times more often in real life than if the atoms were truly arranged randomly, which means they have a significant effect on how a material behaves.

"The physics of alloys and the atomistic origin of their properties depend on short-range ordering, but the accurate calculation of short-range ordering has been almost impossible," said Hyunseok Oh, an assistant professor in materials science at the University of Wisconsin-Madison, in an interview with MIT News. Oh was not involved in the study.

But accurately simulating atoms on the length scales necessary to capture SRO is difficult. "If you want to try to do the most accurate simulations you can on supercomputers, you're limited to 100 to 200 atoms," Sheriff says.

Because SRO is so complex, the simulations need a length scale that is orders of magnitude greater than what is possible with traditional physics-based simulations. This is where machine learning comes in. Using

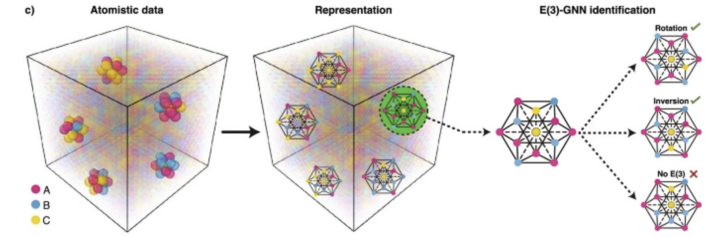
but much more efficiently than the traditional simulations.

The simulation returns an enormous list of the position and velocity of every virtual atom. Like a real high-entropy alloy, it looks like a random jumble, far too large and complex to analyze by eye. "How do we actually make sense of the information that is hidden in those systems?" asks Sheriff.

SRO was previously modeled by counting the percentage of other elements that appeared next to an atom.

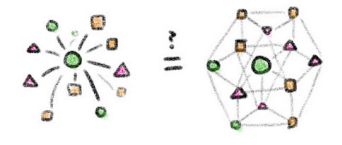


Consider a copper atom. Maybe chromium appears half the time, and nickel a third of the time. But that's not the full picture. As it turns out, how they're arranged around that copper atom — called the chemical motif — is also important. In a common five-element system, there are 9,100 types of chemical motif compositions, but 100 million chemically distinct motifs. That's four orders of magnitude of chemical complexity that was previously ignored.



smaller traditional simulations as training data, the researchers taught a computer how different atoms behave around each other. They created a model called a machine learning potential, which predicts the energy of interactions between atoms

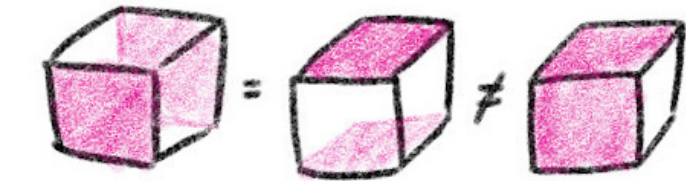
But trying to identify these motifs from an atomistic simulation result is difficult. Inside a simulation, the motifs might be rotated or distorted in different ways, while still being the same motif. Testing if an arrangement of atoms is indeed a certain mo-



tif would typically require the solution to a problem for which there is no known efficient algorithm, the graph isomorphism problem. Instead, the research-

ers sidestepped the problem with machine learning. A Euclidean neural network, designed to have some built-in mathematical understanding of symmetry, takes in a group of atoms and spits out a "fingerprint," or a unique identifier. These fingerprints can be easily compared, so it's easy to classify a group of atoms by comparing its fingerprint to that of a known motif.

However, neural networks can be unpredictable. How do you know that the fingerprints are actually unique that two fingerprints produced by the network are only similar if the original input motifs are the same? To solve this, Sheriff used a math concept called Pólya's theorem.



Suppose you want to paint a cube, and you have two different colors you can use. How many ways can you paint it? The problem is a little tricky because cubes are symmetric — two different colorings might actually be the same if you rotate the cube. Pólya's theorem counts the number of colorings without double-counting those that are symmetric to each other.

It turns out that a chemical motif is a lot like the painted cube, with different colors representing different elements surrounding a central atom. Sheriff used Pólya's theorem to count how many possible unique motifs could exist without double-counting the various distortions and rotations — and then showed that it matched the number of fingerprints generated by the neural network.

With a description of all the different motifs present inside the simulation, the researchers then turned to identifying how these motifs themselves were arranged in relation to each other. They found that SRO could be efficiently characterized by two numbers: one that quantifies how "ordered" the system is, and one that describes the effective size of an SRO.

The researchers compared

their two calculated numbers to those from a known alloy, and found that indeed, they did match. "Thanks to those numbers, we know that it's physically accurate," says Sheriff. "So, that's step one." Step two is to look at how different material properties and processing conditions correlate with the characterized SRO: how does SRO relate to alloy strength? How does the annealing temperature change the SRO? What about the cooling rate? It has been shown that properties such as stress-strain curves have a dependence on SRO, but Sheriff is still working on testing these relationships.

"We can't really go into a lab and decide where we put atoms in those materials," says Sheriff. But it is possible to change the synthesis steps. "And so, we went and ran the simulations

and then computed how much short-range ordering changes."

If researchers could identify the associations between the processing conditions and SRO, as well as the associations between SRO and material properties, then they would have a much better understanding of how to tune the processing steps to affect the resulting material.

Chi-Ken Lu, an assistant professor at Rutgers University who studies physics-based machine learning, is optimistic. Lu, who was not involved in the study, believes that this approach could assist in streamlining the discovery and design of new alloys. "This is of great help for people who are looking for one best material out of a sea of choices."

The researchers' end goal is to use computational tools to design fully custom alloys. The holy grail, according to Sheriff, is to look at a list of required material properties and immediately answer the question: "What elements of the periodic tables do I need — and how do I synthesize them?"

"I really like this project because it mixes a little bit of computer science, a little bit of pure math, a little bit of material science, and tries to make a story all together," says Sheriff.

