Note on the Faculty Petition

Michael Gutierrez
Tech Co-Editor
Editorial

In the previous issue of the Tech, we published a private letter that ~150 professors wrote to President Rosenbaum. The letter, which was not intended to be shared outside the faculty, expressed dissatisfaction with recent undergraduates' academic performance and argued to end the Admissions Office's standardized testing moratorium.

Our purpose in publishing the letter was to ensure that students were included in this conversation, because it was clear that the faculty had no intention of doing so otherwise. It is regrettable that the letter was the way in which their perspective was ultimately publicized; probably all parties would agree that its writing quality and presentation of information were ironically subpar and ineffective. Again, the letter was a private communication not intended for publication. However, the Tech was met with silence when we reached out to the letter's five authors back in February requesting a summary of arguments or a public statement. Professors John Dabiri and Paul Asimow graciously shared their own angles on the letter (see January 16th and February 6th issues of the Tech), but the full text remains the best available representation of all the signatories' perspectives.

The person who shared the letter with the Tech asked us not to print the list of signatures or the appended comments from individual professors; this issue is bigger than any one of us, and calling out specific people would be counterproductive.

That said, of course, the letter featured data from two required classes in the Electrical Engineering option, EE44 and EE55. Specifically, it contained (anonymous) exam scores and grade statistics from the past two years of the courses. In hindsight, especially given the small class sizes in the EE major, it was irresponsibile of us to publish this content without censoring the class names or asking the permission of the students implicated. On behalf of the Tech, I'd like to publicly apologize to the students in those classes for this lapse in judgment. I'm very glad that some of them were able to put together a response to the letter, which can be found in this issue. From my conversations with them, it sounds like we were indeed successful in initiating meaningful dialogue between students and faculty, at least in the EE department.

We Have, and Are Trying, To Do Better

A Response and Update to the SAT/ACT Article

Maya Dickson, Ruth Berkun, Kevin Gauld [SFC Core Chair, CCSC Undergrad Rep]
Op-Ed

On Friday, April 26th, a Tech article was released that took the undergraduate population by storm. Titled "You Can and Should Do Better, Faculty Members," it revealed how the Faculty Board had come to reinstate the standardized testing requirement for undergraduate admissions. The author publicized an internal faculty petition criticizing current student performance in two sophomore-level Electrical Engineering courses: EE 44 *"Circuits and Systems"* and EE 55 *"Mathematics of Electrical Engineering"*.

The petition was scathing, to say the least. And the "Friend of the Students" who leaked it didn't hesitate to point out its flaws. They pointed out that the data wasn't representative. They theorized that the difference in grades most likely stemmed from educational gaps in the COVID years and core classes, not SAT/ACT material. Most of all, they were upset that faculty were discussing performance in such a deprecatory way behind the student's backs. The writer expresses many opinions that many people share at least in part, but they did not fully consider how releasing this petition would actually affect the students.

Students found the text of the petition more than just "painful to hear," as the author predicted. Some felt the petition writers were calling the current undergraduates stupid. Some memed the absurdity of it. And bearing the brunt of all this commotion was a small group of 16-17 students – the majority being the EE sophomores – whose exam scores were the core data of the petition.

The Executive Officer and the option representative of EE organized an office hour first with the EE sophomores, and then a larger meeting with more faculty present for all EE undergraduates, to hear the opinions of the students and tell their side of the story. The majority of what follows comes from discussions during those meetings and in separate encounters with these faculty members, and we appreciate the willingness of the EE faculty to make time for us and organize these.

April 29th sit-in outside Red Door. Photo credit: Ling-Yi Wu

Caltech Protests for Palestine

Lilia Arrizabalaga
News

On Monday, April 29th, there were two on campus demonstrations for Palestine. The first took the form of a silent sit-in on the lawn of the Center for Student Services (CSS) building in the morning from 10:30 to 12:00. The sit-in was set to coincide with the "Deans and Donuts" event which was scheduled for 11:00am, however this event was canceled in an email to undergraduates at 10:15am with no explanation.

The protestors moved from the CSS lawn to outside the Red Door Cafe at around 11:20 am.

According to the undergraduate students who organized the silent sit-in, the main goal is to "start a meaningful conversation about Caltech's affiliation with the military industrial complex and its reaching impacts in Gaza." Protesters covered their mouths with tape "in solidarity with Palestinians being silenced."

The protestors consisted of undergraduate and graduate students as well as a handful of caltech community members. At the peak of the protest there were around 60 people present. There was also a legal observer from the National Legal Guild present who was unable to talk to the press.

The sit-in was organized in response to many similar protests on other college campuses and the lack of protests at Caltech.

"I saw the protests going around multiple campuses around our nation. [It] inspired me to bring this human rights issue to the front of Caltech students' consciousness. No undergraduate had organized a demonstration so I decided to take action," the undergraduate student organizers' email continued.

The second protest took place in the evening organized by Pasadena for Palestine and other faith-based groups from local churches in conjunction with Caltech Students for Justice in Palesting (SJP). The demonstration was part of a larger series of sit-ins in front of congressman Judy Chu's office that take place every monday organized by Pasadena for Palestine.

At 5:45pm, a group of around 20 Caltech students formed outside the Chen Neuroscience Building before joining the larger group of Pasadena residents already marching. The total group numbered around 100 according to eyewitness reports.

Protesters marched through the campus shouting slogans including "Your hands are bloody too", "Caltech, Caltech, pick a side, justice for genocide", "The students united will never be defeated", and "The students united will never be divided." A reporter for the Tech later caught up with the man leading the chants (who had been using a megaphone) and learned he was not Caltech affiliated. Some protesters held signs calling for Caltech to disclose any investments in or funding received by Israel. Protesters led an interfaith prayer for Palestine before dispersing at around 6:30pm.
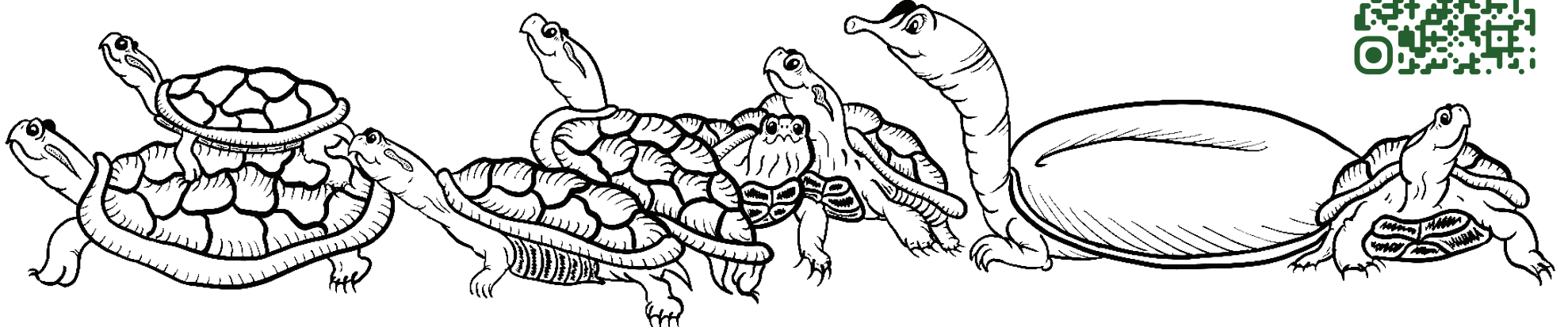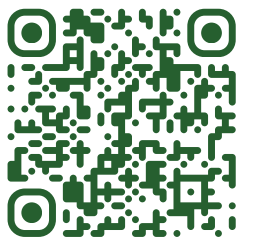
TREASURER ANNOUNCEMENT:
Deadline to use ASCIT Club Funding

Jonathan Booker
ASCIT Treasurer

The deadline to use ASCIT Funding is May 24, 2024.

As stated in the policies in the email that I sent out earlier this year, extensions are available if necessary, but you must communicate your need to the ASCIT Treasurer or the ASCIT Director of Operations. All funds must be utilized by May 24, 2024. If clubs plan to use funding during the summer, it must be specified in the club budget and communicated to the current ASCIT Treasurer or ASCIT Director of Operations by May 24, 2024, to get a summer deadline extension. The deadline for submitting summer reimbursements is July 15, 2024. However, the process for individual reimbursements from the club's bursar account, which does not involve ASCIT, can be conducted anytime.

There is still extra/event club funding remaining. If an extra funding request has already been made and I've yet to get back to you, chances are I received it during the week leading up to formal. Please bump me on that and I'll get y'all feedback as soon as I can. Please submit all extra funding applications by May 24, 2024 as well.

I will need to be strict with this dead line. If you have any questions please feel free to reach out!

Addendum from Jonathan:

Hey! In my financial announcement about ASCIT Funding, can you put an announcement that SIF funding applications are due June 1st?

yep

(that's the Student Investment Fund — great funding opportunity! i have 53 minutes left to finish this layout and don't have time to look up the link, google it yourself <3 -guutz)

Student Affairs Division Reorganized; New Dean of Student Experience

Michael Gutierrez
News

Last Monday, President Rosenbaum announced a reorganization of the Student Affairs division. The changes were recommended in the final report from a Visiting Committee on Student Affairs, who were invited by the Institute to evaluate the division in February. The committee was composed of higher education professionals and student affairs leadership from a variety of peer institutions and companies such as MIT, Harvard, Carnegie Mellon, Harvey Mudd, Pfizer, and Polaris. During their visit, the only time they spoke to any students was during a 30-minute "coffee reception" with members of the ASCIT Board of Directors and the Interhouse Committee.
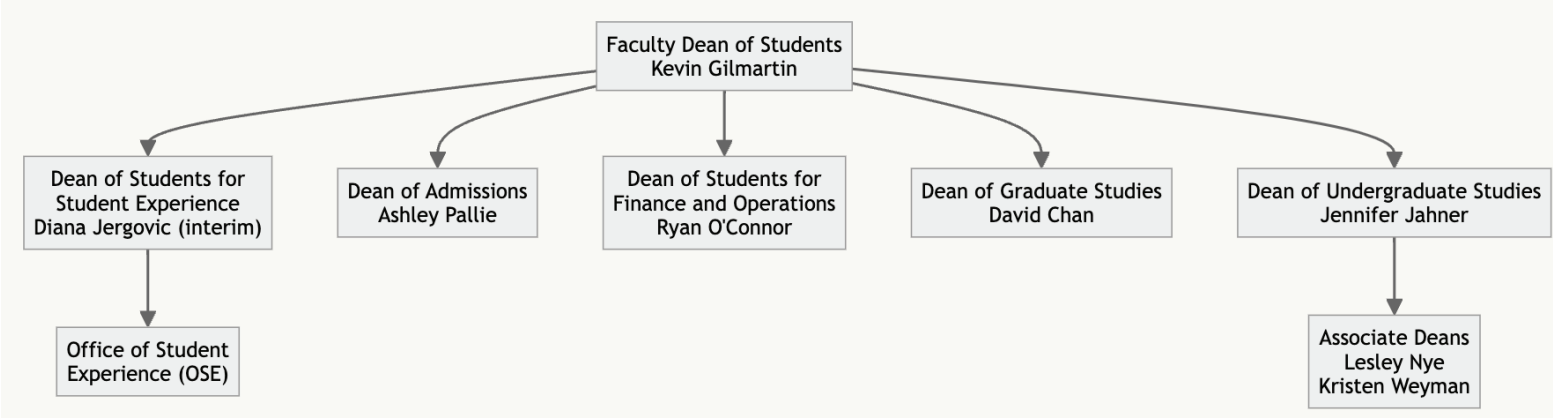
Now known as the Office of the Vice President and Faculty Dean of Students (OVPFDOS — "oof-dahs"), the division will remain under the leadership of the Vice President for Student Affairs (VPSA), Professor Kevin Gilmartin.

The most notable change is the addition of a new position, the Dean of Students for Student Experience (DSSE). The Office of Student Experience (OSE), directed by Assistant Vice President for Student Affairs Felicia Hunt, will now report to the DSSE instead of directly to VPSA Gilmartin.

Diana Jergovic, a Vice President for Strategy Implementation, will serve as interim DSSE. In an email to the Tech, Jergovic explained that "there will be a national search for the next dean of students, student experience. We haven't finalized a process yet, but we will work with a search firm and student leaders will be involved in part of the process."

When asked if she has any goals for her time as DSSE, Jergovic responded, "To support my professional colleagues in the office of the vp and faculty dean of students in their continued work to enhance Caltech's student experience."

Two other dean positions have been created as well: Dean of Admissions and Dean of Students for Finance and Operations. These positions will be assumed by Director of Undergraduate Admissions Ashley Pallie and Business Operations Officer & Chief of Staff Ryan O'Connor, respectively. These changes are only nominal – each will continue their current duties.

Including Undergraduate Dean Jennifer Jahner (welcome back from your sabbatical!) and Graduate Dean David Chan, there are now a total of five deans that report to VPSA Gilmartin. Two (Jahner and Chan) are faculty, and the other three are staff.

Regarding the impetus behind these changes, Jergovic stated, "Over the last few years, we have made a concerted effort in collaboration with our trustees to evaluate operations and activities supporting the student experience. President Rosenbaum, Professor Gilmartin, and many others contributed to the continuing dialog, students and alumni contributed to the C3 report and implementing its recommendations, and higher ed and student affairs professionals, along with trustees, faculty, and students contributed to the visiting committee process."

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Faculty Dean of Students
Kevin Gilmartin
├── Dean of Students for Student Experience
│   Diana Jergovic (interim)
│   └── Office of Student Experience (OSE)
├── Dean of Admissions
│   Ashley Pallie
├── Dean of Students for Finance and Operations
│   Ryan O'Connor
├── Dean of Graduate Studies
│   David Chan
└── Dean of Undergraduate Studies
    Jennifer Jahner
    └── Associate Deans
        Lesley Nye
        Kristen Weyman
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The Joys of Living Off Campus

Hannah Fisher
Opinion

Are you a Caltech undergraduate frustrated by this year's housing lottery? Have you been living on campus and suffering from your dorm building often being too loud or smelly or in need of maintenance? Were you conflicted between living in a House or trying your luck with the new Bechtel lottery process? There is another option! I have lived off campus (not Bechtel off, but *off* off) this year, and it has been fantastic! Nearly every aspect of my housing experience has been significantly improved by living off campus, and I would recommend it to everyone who is feeling even the tiniest ounce of frustration with Caltech Housing.

The most immediate improvement of living off campus is the nicer and larger living space. My apartment building was renovated last year, giving us all new kitchens, floors, bathrooms, etc. By contrast, the North Houses were last renovated …. never? While living in a House or Bechtel, I frequently witnessed bug infestations in the kitchens, leaky pipes dripping from the ceiling for months on end, and strange and pervasive smells. Living in an off-campus apartment, I have never experienced any of these issues. Any time maintenance is happening in my apartment building, it is communicated well in advance and completed very quickly. Additionally, the living space size in an apartment is likely to be much larger than in on-campus housing. My single bedroom is over twice the size of a Bechtel room, I share a bathroom with only one other person, and our kitchen is around the same size as a Bechtel kitchen.

On top of all these improvements in the physical living space, living off campus is also significantly cheaper! For those living on campus, the cost of housing ($3749 per term) plus the required meal plan ($2478 per term for the cheaper "Flex" option) comes out to $2075 per month. Off campus, I pay $1200 in rent, ~$100 for utilities, and ~$300 for food, for a total of $1600 per month. Over the course of the nine-month academic year, I am saving $4275 by living off campus and buying my own groceries.

While there are a few downsides to living off campus, they are far outweighed by the benefits. One potential concern is the added time it takes to get to classes; I live one block away from campus, so I am able to walk from my front door to any of my classes in less than ten minutes. Many students who live farther away use a scooter, bike, or car to get to campus just as quickly. Being off the meal plan, I buy my own groceries, cook meals for myself, and pack a lunch to bring to campus every day. For those who enjoy cooking, this is a major improvement over the Caltech meal plan. To me, the only downside of being off the meal plan is the annoyance of carrying a lunchbox around all day. Even without a meal plan, it is always still an option to buy food on campus at the listed price at Browne, Red Door, or Broad.

If you are considering moving off campus for next year, I urge you to do so! Finding housing off campus may seem daunting at first, but it is relatively easy: ask current students you know who live off campus, or browse for listings on Zillow. com and Apartments.com and start cold-calling or emailing the landlords. By opting out of the Caltech housing lottery and finding your own housing off campus, you can spend the next year living in a nicer, larger, and cheaper space, and free yourself from the annoyance and frustration of interacting with the Caltech Housing office ever again.

The Avery Greenhouse Effect

Henry Lane
Op-Ed

Caltech is literally killing you. The workload is inundating, the stress is nonstop, and the sleep is nonexistent. But the stressors of this Institution go beyond the mental. Caltech-hired landscapers have been criticized for spraying carcinogenic herbicides around graduate student housing [Pasadena Star News, July 18, 2019], Dining Services' takeout containers and cups are most likely leeching microplastics [Fangni et al. (2020), Journal of Hazardous Materials], and anyone with a functioning set of taste buds recognizes that the water is oddly metallic. But an under-recognized source of malaise is the architecture of Caltech. While you may think that I am criticizing the eyesore that is the George W. Downs Laboratory of Physics (where the shock of seeing such an ugly building forced me to switch my major from Physics to BioE), I am actually criticizing how the architecture stagnates the air within the dorms.

How did I become aware of this issue? The short of it is that, during my freshman year, I:

• acquired a chronic infection that blew up into appendicitis,
• was denied death,
• met what or who Christians tell me is "God," what the Hindus tell me what or who is "Brahma," and Buddhists tell me is the "self," and
• became obsessed with the basic tenets of good health like food, water, air, and exercise in hopes of never again facing Lady Death (who, in my experience, is an entirely different, albeit pleasant fellow).

In doing so, I got an air filter with the expectation that I'd be hoovering away the carpet cleaners that Housing liberally lathers onto every imaginable surface. On a whim, I got an air quality monitor. After all, why not have some metrics to quantify the effectiveness of my interventions?

What I did not expect, though, was to find that the air quality monitor was a better investment than the air filter itself. Immediately upon setting it up, my monitor generally found the particulate matters scores (and hence air quality) to be rather acceptable. However, what was alarming was the ambient reading of 1400 ppm CO2 in my room. For those who do not have the thumb-stick guidelines of air quality internalized, anything above 1000 ppm is synonymous with "open your window!" [American Society of Heating, Refrigerating and Air-Conditioning Engineers] Surely my CO2 meter was wrong, I thought. But no. The atmosphere—serving as an easy calibrator—read an expected 400 ppm CO2 [climate.nasa.gov]. Breathing into the device skyrocketed the reading to nearly 40,000 ppm, which was also expected [Issarow et al. (2015), Journal of Theoretical Biology]. Continual measurements with the meter revealed that my room actually averaged from 1400-1800 ppm, even when no one was in the room. From there, the only question that naturally followed was, "how high can these levels get when I'm sleeping?"

Given that my roommate and I cannot choose to stop ourselves from breathing, the answer is about a plateau of 2200-2600 ppm CO2. When we hosted a CUCer (Caltech Up Close participant; Caltech did not think this name through, evidently), levels reached a brain-adulterating 3700 ppm. In fact, the levels of CO2 are so highly correlated to the number of humans present in our room that I can estimate when my roommate returns for the night by simply observing when a major uptick occurs on the monitor.

It is almost self-evident that these levels of CO2 are unhealthy. This can simply be observed by going outside after spending a night in the airtight boxes that are Avery dorms and noticing that your brain comes alive after feeling starved for air. However, for the statistical aficionados among my readers, the detrimental effect of CO2 concentrations in indoor spaces can be quantified (and no, you should not use these as a guideline to figure out how much caffeine you need to "cancel out" the effects of stale air. Go outside).
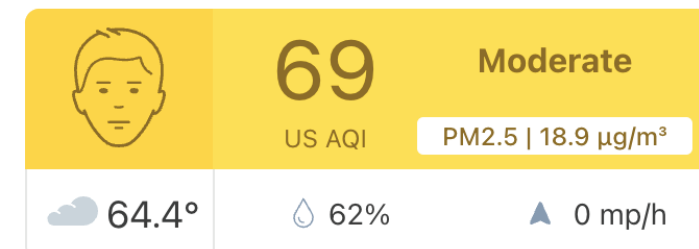
Conventional wisdom says that CO2 is not a direct pollutant, but rather an indicator of stale air which, in turn, contains pollutants that are responsible for the associated effects of high CO2. However, researchers from the Department of Energy's Lawrence Berkeley National Laboratory disputed this wisdom in a study of 24 participants, mostly college students. The researchers subjected the subjects to a Strategic Management Simulation (SMS) — a generalized test utilizing computerized simulations of everyday tasks, employed in both clinical and professional settings to assess the influence of agents such as drugs, pharmaceuticals, brain injuries, etc on cognitive performance — under elevated CO2 concentrations. Students were placed in small-office-like chambers for 2.5 hours at three concentrations of CO2: 600 ppm, 1000 ppm, and 2500 ppm. Ultrapure CO2 was injected into the air supply and stirred into the surrounding air, with all other factors (temperature, humidity, ventilation rate, pollutants, etc) kept constant. Across all metrics, at both 1000 ppm and 2500 ppm, obvious effects were noted by the researchers relative to the baseline of 600 ppm. Scores in categories of basic & applied activity, information utilization & usage, initiative, and basic strategy all decreased in the neighborhood of 20% to 50%, with some (such as initiative) decreasing by a whopping 91% at 2500 ppm [Satish et al. (2012), Environmental Health Perspectives]. It is important to note that these metrics are derived from a score, which are derived from a contrived test, that show the effect of CO2 on artificially constructed metrics and tasks. Further, the study only utilized 24 participants, so it does demand that, if one wants to generally quantify how it affects humans, we should employ larger studies. However, despite the limitations of the study, such startling results suggest that overall brain function may be negatively impacted and that we must seek out more studies and metrics to understand how extreme this effect might be.

Harvard's CogFx study shines some light on this. CogFx took a cohort of 302 office workers in six countries—China, India, Mexico, Thailand, the UK, and the US—and measured the effects of CO2 on cognitive function. In these studies, they employed a Stroop test (where color names are colored different colors, e.g. "Purple," but colored blue and one must correctly name the color of the word) and an addition-subtraction test. For every 500 ppm increase, the researchers found that their response times for these tests slowed by 1.4-1.8%, and throughput (the rate of correct responses per minute) to be 2.1-2.4% lower [Laurent et al. (2021), Environmental Research Letters]. While these numbers don't appear to be too large in relation to the Berkeley study, one must keep in mind that they're per 500 ppm increases, meaning at the average CO2 concentrations within my dorm room (about 1400-1800 ppm), I can expect my cognition and my ability to answer questions to be impaired by three times the above rates. And this is just while I'm awake. While I'm not solving integrals in my sleep (unless the stress of exam season gets so bad that this school invades my only refuge — dreams), I cannot imagine an agent that decreases my cognitive function to be beneficial to the memory consolidation [Klinzing et al. (2019), Nature Neuroscience], clearing of cellular trash from my brain [Eugene and Masiak (2015), MEDtube Science] and the general repair processes that occur while I sleep [Peters (2010), Verywell Health].

Generally, it needn't be harped on as to why students at Caltech should care so much about the quality of air and how it affects our cognitive function. It is quite simple: you cannot not breathe, and if the air is polluted or suffocates your brain, then you are forced to breathe it in. At such a high octane school, even a minute decrease in response times and throughput correctly not only directly impacts our grades, but also our confidence and every downstream consequence of that (mental health, physical health, the whole shebang).

And what to do about this problem? The obvious answer is "open your window," but respectfully, the air in Pasadena is part of the LA basin ecosystem, and hence the outdoor air is completely awful. Fine particulate matter (2.5 microns, or PM2.5) is an antagonist to human health linked to increasing the rates of cancer, heart disease, and practically every chronic illness [World Health Organisation]. Further, Pasadena experiences an average of 13.8 unhealthy PM2.5 days a year, and 111 of 365 unhealthy ozone days. To understand just how bad this is, the EPA targets no more than 3.2 unhealthy ozone days per year. Worse yet, in terms of PM2.5, the American Lung Association notes that Pasadena air fails to meet federal targets for both short and long term exposure and ranks in the top ten for the most unhealthy levels nationwide [iqair.com].

And what do I personally do? In my own case, my room is situated next to Del Mar Blvd on the outskirts of campus, so I truly believe it to be a hazard to keep my window open on a bad day; I've woken up with the back of my throat caked with a dehydrating pith of some chemical monstrosity, no doubt a concoction of cancerous gasoline byproducts and even MORE microplastics from tires [ADD CITATION]. Further, our air conditioners are self-cycling and not connected to the outdoors, so it's not as if we can pull in filtered fresh air as is possible in Venerable House. As I see it, there are only four solutions: 1) don't breathe, 2) move out of Avery, 3) get a window adapter that allows my filter to suck in air from the outdoors, 4) knock down Avery house and rebuild it with healthy circulation air in mind. None of these are particularly attractive, and while 3 seems the most practical to me, it isn't advice that one can give out to the general student population as it demands they whip out their construction skills, drain their wallets, and buy an air filter.

Now, after yapping for 1600 words that basically summarize to, "My window is open except for when the air outside sucks," all I can really encourage is just try it out yourself. Maybe I wrote this article to complain and I've managed to annoy every house for complaining about Avery facilities. Or maybe, it's an ask to just be aware of the subtleties around us and how they affect you, personally. Open your window, maybe. Drink some water, maybe. Get some sunlight, maybe. Go outside, maybe. There's really not too much more to say. If living and dying has taught me anything, it's that there's a whole world out there, and there's nary a neuron in any of our heads that's going to benefit from being stuffed in a stuffy brain in an even stuffier room.

Pasadena air quality index (…

15:00, May 16

69 US AQI — **Moderate** — PM2.5 | 18.9 µg/m³

64.4° | 62% | 0 mph/h

New IHC Committee Chairs and ASCIT BoD

IHC Secretary
Elisa Grillo (Venerable BE '26)

RevComm Chair
Thierno Diallo (Blacker CS '25)

Athman
Raymond Provost (Page '27)

ASCIT President
Sophie Elam (Fleming ESE '25)

ASCIT Social Director
Ashlyn Roice (Page/Lloyd CS '26)

Orange Watch Coordinator
Simon Hu (Page/Lloyd CNS '26)

FoodComm Chair
Matthew Torres (Venerable BE '25)

ARC Secretary
Ritvik Teegavarapu (Bechtel ACM '26)

ASCIT Director of Operations
Ava Barbano (Ricketts CNS '26)
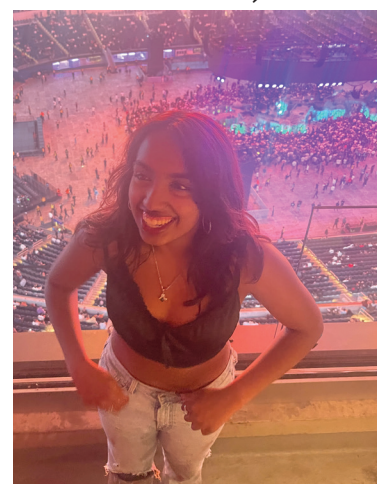
ARC Chair
Jeb Brysacz (Page CS '25)

Stew/Comm Chair
Ethan Labelson (Blacker/Dabney/Ricketts EE'26)

AdComm Chair
Sanvi Pal (Venerable CS '26)

ASCIT Secretary
Claire Ellison (Ricketts '27)

ASCIT Treasurer
Jonathan Booker (Ricketts Ph/CS '25)
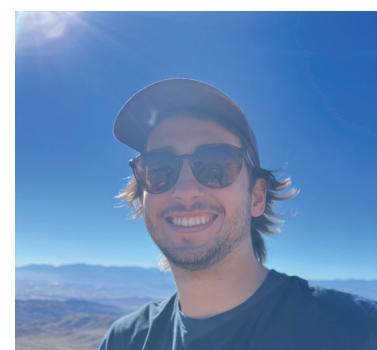
Unaffiliated CRC Rep
Michael Gutierrez (Dabney/Ricketts AY '25)

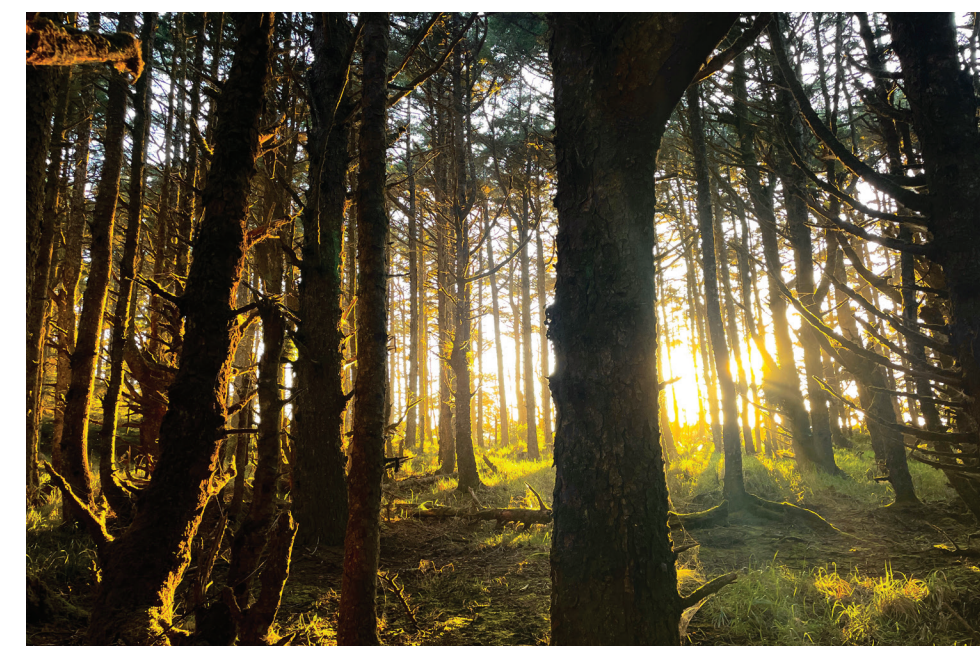*Due to lack of time, we just used everyone's Donut picture. Sorry/you're welcome.*

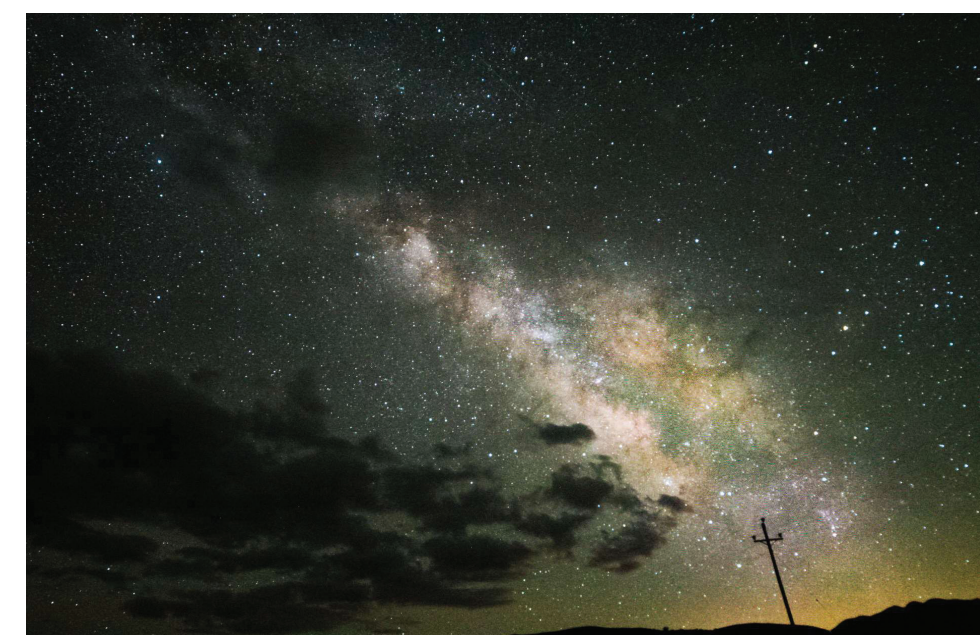# Art and Photography Spotlight
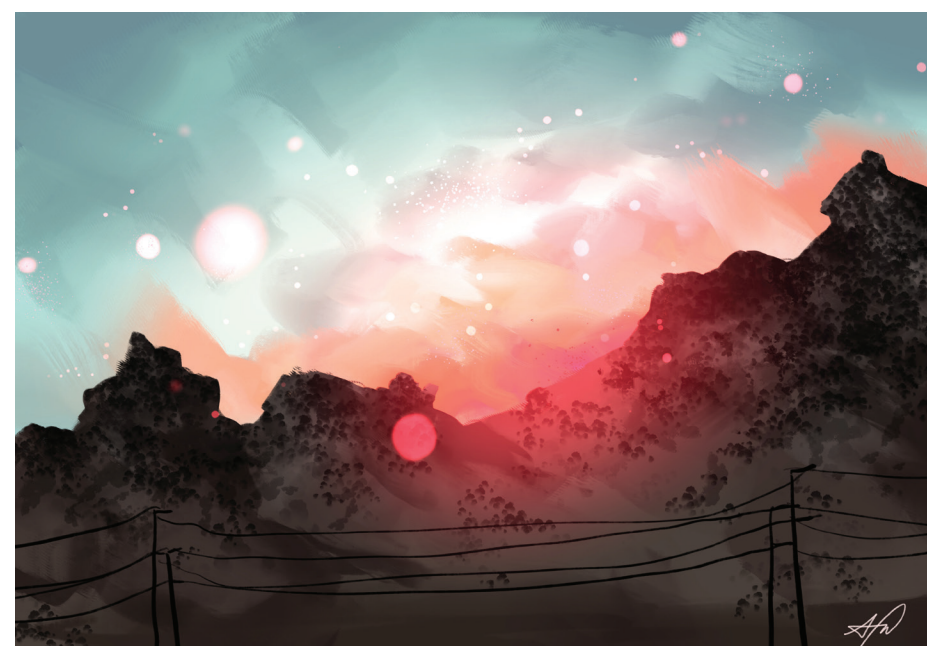
"Sunset Road" by Audrey Wong

"Cliffside Forest" by Juan Luchsinger

"GDBG" by Sophie Gershaft, Albert Huang, and Toby Thomassen

"Galaxy" by Sylvia Wang

Quantum Hype and the End of Half-Decent Writing in Media

A Cinema-Going Physicist
Culture

The frustration with the overuse and misapplication of the term "quantum" in contemporary media, particularly within the realm of sci-fi films like those in the Marvel franchise, is palpable. It's evident that the term has become a crutch for writers seeking to inject their narratives with a veneer of scientific legitimacy, often at the expense of coherence and genuine creativity. The trend ranges from the introduction of concepts like the "quantum realm" in films like Endgame to the lazy justification of plot contrivances through vague references to quantum mechanics. This reliance on quantum buzzwords not only betrays a lack of originality but also underestimates the audience's intelligence by assuming they require such flimsy justifications for the rules of the story's universe.

Genuine innovation in storytelling, reminiscent of classics like "2001: A Space Odyssey" and "Looper," seems increasingly scarce amidst the sea of formulaic plots bolstered by superficial scientific jargon. Instead of embracing the inherent wonder and complexity of the universe, writers opt for shortcuts that diminish the impact of their narratives. The dissatisfaction expressed by audiences reflects a desire for stories that challenge conventions and engage with themes on a deeper level, rather than relying on gimmicks and hand-waving explanations.

In this landscape, the longing for a return to storytelling that captivates the imagination without resorting to tired tropes is palpable. Audiences crave narratives that transport them to new worlds and provoke thought, rather than leaving them feeling disillusioned by the superficiality of lazy writing. It's a call for writers to rediscover the art of storytelling, where creativity reigns supreme and the constraints of reality are transcended through ingenuity, rather than obscured by the misuse of scientific terminology.

The issue extends beyond the realm of film, permeating other forms of media and even popular science discourse. The allure of the term "quantum" seems to have a hypnotic effect, leading writers and creators down a path of least resistance, where the semblance of scientific accuracy takes precedence over narrative integrity. This phenomenon reflects a broader trend in society, where complexity is often simplified and sensationalized to the detriment of genuine understanding.

Moreover, the misuse of scientific concepts like quantum mechanics perpetuates misconceptions and trivializes the complexities of the natural world. It creates a false impression that science is a mere tool for storytelling, rather than a rigorous discipline that requires careful consideration and respect for its principles. This trend not only erodes the credibility of scientific inquiry but also reinforces a shallow understanding of the universe and its mysteries.

As consumers of media, it is essential to demand more from creators and to challenge the lazy tropes that have come to dominate popular culture. By encouraging originality and depth in storytelling, we can reclaim the sense of wonder and curiosity that is intrinsic to the human experience. Let us not settle for quantum hype and half-decent writing but instead aspire to narratives that inspire and enlighten, transcending the limitations of buzzwords and clichés.
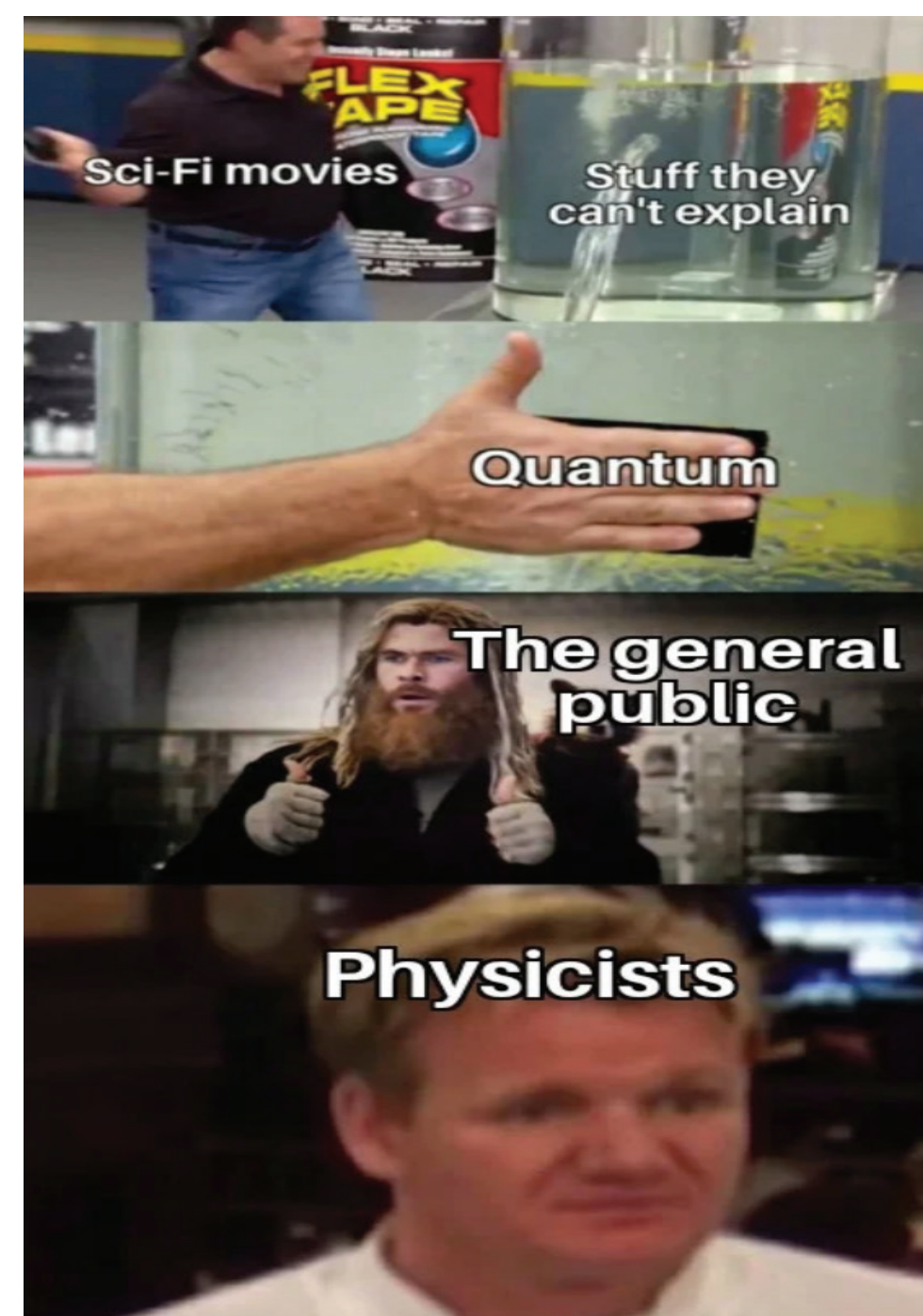
Note on the Faculty Petition

To you, dear reader, thanks for bearing with us as we learn from our mistakes. It's an honor to represent the astonishing diversity of voices throughout the Caltech campus — if you want to make yours heard, whether to the Tech's editorial team or to the entire community, please feel encouraged to drop us a line at tech@caltech.edu, or on our new feedback form at tech.caltech.edu/hello.

We'd love to hear your thoughts on how to communicate your thoughts!

Response to SAT Article

We do recognize that not every perspective is considered here because we mostly talked to EE faculty and we (the writers) are EE, but we hope this can clear up some of the confusion and emotional distress surrounding this petition. Our intention is simply to inform, and hope that there is no greater conflict caused by this response.

One of the primary causes for the upset caused by the petition is simply missing context. For starters, it is easy to forget that the intended audience of the petition is the faculty. As such, the petition omits faculty discussion prior to and after its authorship, removing much of the context from an external perspective. The faculty have assured us that **this petition is not indicative of all discussions on the topic.** There have been nuanced discussions with more comprehensive analysis taken into consideration by the faculty board, regardless of the harsh words in the petition, specifically in the context of the return to standardized testing. Though this petition was criticized for not providing routes to support current students, the faculty have confirmed to us there are other committees dedicated to discussing exactly that. This petition served as

an addition to the discussion regarding standardized testing and the tasks of the admissions committees, not to the discussion of supporting current students. This does not imply that faculty aren't supportive of the current students, but rather that this petition was not the right means by which to have the discussion of supporting current students.

The data, while largely non-representative of the entire undergrad population and not taking into account all factors (i.e. ignoring the differing exam formats for the compared years of EE 55), was supposed to bring unavoidable facts to close a long drawn-out discussion on the return of standardized testing. To the faculty, this petition summarized the most dramatic of the limited evidence they had to reinforce their position on previous discussions, hence why the petition reads as very harsh and lacking a nuanced argument. For this, several faculty expressed they were sorry for the hurt the petition leak caused students, both within the meetings and during individual encounters. While desperation doesn't necessarily excuse the faculty from pre-port, and is also one of the theorized causes for why students feel underprepared for classes like EE 44 and 55. As the op-ed mentions, recent revisions to the core curriculum may be partially to blame for the drop in diagnostic exam scores. Last year, the Student Faculty Conference (SFC) ran a special topic on the core curriculum, surveying the views of 300 undergraduates on the current state of core. The data collected by the SFC committee support the idea of core's failure to teach fundamentals: while 97% of students come to Caltech with a college level equivalent course in a core-represented subject, only 54.5% feel prepared for core, with 54.6% reporting they do not believe Caltech provides the resources necessary to bring all students up to the standards of core. With regards to core math, which is especially relevant for EE 44 and 55, the SFC survey also reports an astounding 68.6% of students believe that Ma 1a did not improve their understanding of calculus, with 25% of students continuing to struggle

clusion of these comments, the connotation becomes the more neutral "students who received D and F grades." While some of us did not receive the best grade in these classes, the faculty do not believe that we are stupid. They genuinely want us to succeed, and want to support us in any way that they can. They are proud of our accomplishments and happy to support us in our harder times. As mentioned before, there are many different committees of faculty that consider many aspects of the student experience. Major requirements, class sequences, class content, general education reform, etc. are all subjects of faculty discussions. As an example of the changes enacted by these committees, the EE major has recently added popular tracks in Computer Engineering, Medical Engineering, and Intelligent Systems, providing students much needed flexibility when choosing a specialization for their studies at Caltech.

Another highly discussed topic among the faculty is the core curriculum. Core is one of the most mentioned topics when it comes to faculty support, and is also one of the theorized causes for why students feel underprepared for classes like EE 44 and 55. As the op-ed mentions, recent revisions to the core curriculum may be partially to blame for the drop in diagnostic exam scores. Last year, the Student Faculty Conference (SFC) ran a special topic on the core curriculum, surveying the views of 300 undergraduates on the current state of core. The data collected by the SFC committee support the idea of core's failure to teach fundamentals: while 97% of students come to Caltech with a college level equivalent course in a core-represented subject, only 54.5% feel prepared for core, with 54.6% reporting they do not believe Caltech provides the resources necessary to bring all students up to the standards of core. With regards to core math, which is especially relevant for EE 44 and 55, the SFC survey also reports an astounding 68.6% of students believe that Ma 1a did not improve their understanding of calculus, with 25% of students continuing to struggle

with calculus after this course. We do acknowledge, however, that core is continuing to reform to benefit students, and these shortcomings will not always hold true. Throughout this year, the Core Curriculum Steering Committee (CCSC), chaired by Dr. Mitchio Okumura, has been working to enact the suggestions raised during last year's SFC to reform the core curriculum. The faculty know core has much room for improvement, and committees like the CCSC are working to bring these improvements to fruition, providing students with a solid foundation prior to sophomore year.

Lastly, the students and faculty agreed that EE 44 and EE 55 scores were not at all indicative of overall success. EE 44 is about linear circuit analysis, which relies heavily on differential equations and gnarly algebra. EE 55 covers linear algebra and probability in the context of information theory. Both are mathematically intensive, and known to both faculty and students as the most demanding core classes in the EE major. Though the petition describes EE 44 as "introductory" and 55 as simply "Mathematics of EE," the intended audience of the petition would know that these classes build off of the basic skills tested in Quiz 0 and teach a plethora of difficult concepts, with challenging math to match. Senior EEs acknowledged that they too had struggled with these classes, yet had grown so much after them. Professor Azita Emami, who teaches EE 45 (a core sophomore EE class after 44 and 55), said she hadn't found the smores to be particularly better or worse than previous years she had taught, regardless of the grades in 44 and 55. She expressed the professors' pride in their students and their belief that the students would obtain mastery in electrical engineering by graduation regardless of the major. In another meeting, the faculty emphasized the importance of learning what you are interested in, rather than focusing on grades. They asserted that a lower grade does not mean that you will not be successful, and that a passion for what you do is much more

important (to grad schools and companies too) than a perfect GPA.

While this experience is unfortunate and should not have happened, some good came out of it. Since the publication of the op-ed, there have been numerous conversations between students and faculty within and outside the EE department centered upon faculty support for student life. While the faculty operate at a noticeable disconnect from the students, they have expressed their willingness to advocate on our behalf to bring change to benefit our student experience. While it may seem intimidating or difficult to reach out to the faculty, they are nearly always willing and available to talk to students about how they can use their position to provide support. To students outside EE, we recommend connecting with the faculty in your department to let them know how to better support the students. Though sometimes professors may seem far out of reach or like an idol, they too are humans who care for their students, so don't be afraid to talk to them. To the faculty, reaching out on your side separately from the classroom through, for example, departmental socials, is helpful too. The Student Faculty Conference (SFC) held in alternating years is also a helpful resource to align both student and faculty perspectives regarding each major.

Although we have not yet resolved all of the issues with this faculty petition, we hope this response not only brings to light the context behind the petition, but also restores confidence in yourself and/or faculty, while bridging the divide between the students and faculty. We would like to extend sincere gratitude to all of the faculty who supported us and brought clarity to this discussion, especially to Ali Hajimiri, Azita Emami, Babak Hassibi, Changhuei Yang, and Glen George for their inspiring and genuine comments at the EE faculty open house. We hope that through continuing discussions with the faculty, we can improve Caltech for both students and faculty from here on out.

Have You Ever Wanted to Ride a Miniature Train? Here is Your Chance.

Gabi Twombly
The Outside World

Photos courtesy of Gabi Twombly

On the 3rd Sunday of every month, the Walt Disney Carolwood Barn opens in Griffith Park. Their website states, "The Carolwood Foundation's mission is to preserve Walt Disney's railroad legacy. We accomplish this through: sharing our volunteers' and supporters' love of railroading; teaching our children to understand the role that railroads served in building America, and encouraging the continual appreciation of railroading." Being a Disney fan, I went to check it out last month on the 21st. The site sits less than a mile past the entrance of the LA zoo tucked away on the side of the hill. Parking wasn't difficult to find right across the street, although the line to enter can get a bit long. There were tons of train tracks criss-crossing each other on the grass and dirt as I entered the gates. The setup is split into two parts: the left side has the barn, food, and some historical material, and the right side has the miniature trains. I entered from the right since I wanted to get on the trains before they closed (opening hours are 11am-3pm). $4 will get you a ticket for a 15 minute ride on one of the small engines. In this economy, I'll take that as a win. We took off from the station after a 10-minute wait and chugged through small towns and by waterfalls, through tunnels and over bridges. The left side of the park has a separate

entrance a walk away. No entry fee was required and I stepped right in to see the barn. Inside, we could see all the Disney posters, sketches, and replicas of old trains Walt Disney used to work on as a hobby. Walt Disney was a very big train enthusiast with some of the earliest versions of the Disney parks being centered on trains. The barn displayed was relocated from his backyard where he used the mini-trains to entertain his family and friends.

Outside the barn, you can look inside an old railcar once used in the theme parks or waive to the passing engines. All in all, a fun experience if you want to get out and see something new.

You can still enjoy the trains today in Griffith or on the Disneyland Railroad in the theme parks! I highly recommend stopping by. They're planning to celebrate their 25th anniversary this coming July the 19-21st.

This Week in *Tech* History... May 16, 1997

Prank topples after staff blunder

BY TECH STAFF

Dabney Hovse members mourned the loss of one of their palm trees last Friday, when miscommunication led B&G to topple the tree which had been relocated to the Court of Man as *prank. The palm tree broke at the base and fell in Dabney Courtyard Thursday night.* A large group of Darbs then moved the tree to the south side of the Court of Man and erected scaffolding to hold the tree upright. *The base of the tree was set in a drainage hole for further support and stability.* Caltech security observed the industrous Darbs raising the tree and attempted to establish who was in charge. Dabney Hovse president Geoffery Matters

stepped forward to discuss matters with the officers at hand. The security officers present came under the false impression that "permission" had been granted by a Caltech Administrator. In actually, Geoffery had acted in his presidental power, santioning the prank under the name of Dabney Hovse. At roughly 1:30 a.m., Security called Director of Residence Life Kim West about the palm tree. Security was told by Kim West that "If it doesn't look dangerous, leave it up. If it looks dangerous, either get the students to take it down or call the Deans to get their

An embarrassed Gary Lorden says "It won't happen again"

permission to take it down." According to the security report obtained by *The California Tech*, no further action was taken that night by Security.

Around 5:30 a.m., Dule Misevic, a Darb, talked with a Caltech security officer who appeared to be "guarding" the now roped-off the palm tree. He was told by this officer that the tree was to be taken down by the grounds crew at around 6 a.m. When Dule asked why the tree couldn't stay up for a while longer he was told that it wasn't authorized and had to be removed. Later in an interview

with the Tech, Gregg Henderson, Chief of Security Operations, stated that authorization is not necessary for pranks. Robert Fort, Director of Physical Plant, and William Irwin, Deputy Director of Physical Plant, confimed this later. Dean of Undergraduate Students Jean Paul Revel noticed the tree as he came to work at around 6:45 a.m. When asked to comment on the tree, Revel said that it was "cute." By the time Dean's Assistant, Suzette Cummings, arrived at 8 a.m. the tree had been removed, presumably by Caltech Buildings and Grounds (B&G).

Cy Carlberg, the head of B&G is currently on vacation and was not avaible for comments. Both Vice President of Student Affairs Gary Lorden and Caltech

President Thomas Everhart were very disappointed that the prank had been removed before most people got to see it, including themselves.

Also interviewed Wednesday by a crack team of Tech investigational reporters was Vice President of Student Affairs Gary Lorden. He acknowledged that the removal of the tree was not authorized by the administration. He further defined adminstration as being people whose offices are in Parsons-Gates. "I'm embarrassed that this happened," said Vice President for Student Affairs Gary Lorden.

In order to avoid future miscommunications concerning student pranks, The Director of Physical Plant recommended that students contact him directly. His extension is x4707. Outside of working hours security should be able to reach him.
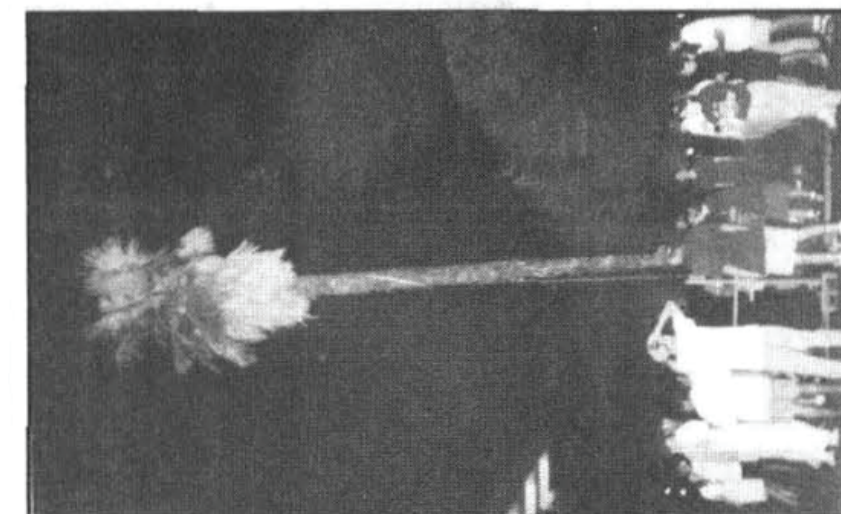
Dabney's palm tree, before it was prematurely removed from the Court of Man

Palestine Demonstrations

According to a representative of Caltech SJP, the main goal of the protest was to raise awareness of Caltech's institutional complicity in Palestinian genocide. "It's not for us to tell the students what to do. We're just here to tell the students to rise up," said a member of the protest from Pasadena for Palestine. The protester who had been leading the chanting also stated that they wanted to show Caltech students that they would be supported if they chose to engage in further pro-Palestine activities.

The Pasadena-based group, which is not affiliated with Caltech, said their choice of location to protest on Caltech campus was to encourage students to take action now in light of many other protests happening at other college campuses and was part of their collaboration with the Caltech SJP.

Caltech President Thomas Rosenbaum released a statement to the Caltech community on Tuesday, April 30th about these demonstrations. Rosenbaum stated that the protests were peaceful and did not disrupt campus operations. He went on to say that "these protests occurred in violation of Caltech's Free Speech and Expression Policy because the Institute was not notified of the events in advance by an authorized campus organizer." The campus free speech policy, which had been in place since 2003, was recently updated on April 26th. The letter warned that members of the Caltech community who proceed with these activities will be subject to campus disciplinary measures. In addition, members of the community external to Caltech engaging in these activities "may be subject to other actions including civil or criminal proceedings."

Sit-in outside the CSS building. Photo credit: Julia Ehlert

Protesters during the evening march. Credit: Umran Koca

Protesters during the evening march. Credit: Ling-Yi Wu

Changes to Caltech's Free Speech and Expression Policy Explained

Lynn Feng
News

On April 26th, an email from President Rosenbaum and Provost Tirrell announced an update to Caltech's Free Speech and Expression Policy in response to ongoing protests over Gaza occurring in many campuses nationwide, including our neighboring UCLA.

The old policy

The former Free Speech and Expression Policy is about a page long, with five numbered points summarized as:

1. The Institute can specify when, where, and how organized expression (e.g. marches) occur

2. Such events need a Caltech-affiliated sponsor. The sponsor must make arrangements with the appropriate admin office before the event.

3. The office will designate space for the event. Electronic sound amplification and unapproved fundraising are banned.

4. Non-sponsored outside individuals do not have a right to access campus.

5. This is not meant to limit distribution of printed material about Caltech affairs by members of the Caltech community.

The new policy

In contrast, the new Free Speech and Expression Policy is five pages long, divided into an introduction and five sections A-E, summarized as:

Caltech upholds freedom of expression, including the right to peaceful protests and to offensive speech. However, Caltech may still restrict speech which threatens individuals, is illegal, disrupts Caltech's operations, violates Institute polices, etc.

A. Rules of Conduct: no one may interfere with building entrances/exits, emergency alarm systems, or traffic. No one may engage in activity that endangers personal safety, damages property, violates privacy, or disrupts normal Institute operations. The sponsor of an event is responsible for any damage that occurs.

B. Organized Expression:
1. Organized expression (e.g. marches) need a Caltech-affiliated event sponsor. The sponsor must make arrangements with the appropriate admin office before the event.
2. External speakers with a Caltech host are allowed with official approval.
3. The responsible admin office will designate space for events. Event sponsors are responsible for reasonable associated costs (e.g. security).
4. Camping on campus is not allowed without permission.
5. Memorials and other displays are allowed in Hameetman or the CSS foyer for up to 7 days. People can contact the OSE to reserve space.
6. Non-sponsored outside individuals do not have a right to access campus.

C. Banners, Leaflets, and Sound Amplification:
1. Specified Caltech-affiliated groups can display posters on designated community bulletin board areas. Written material posted must include the name and contact info of the organization/individual responsible, and the title/date/location of the event, if applicable.
2. Electronic sound amplification is banned unless it will not interfere with normal activities.

D. Fundraising, Commercial, and Political Activity: Fundraising is banned unless it complies with Institute policies and is pre-approved. A separate Caltech policy regulates political campaigning.

E. Non-Endorsement Language: In associated written material, event sponsors must clearly indicate their views do not represent Caltech's.

NOTE: We have written these summaries for context and convenience. Anyone interested in organizing a protest or other related event should consult the original text of the policy, linked in the QR code provided.

The contents of the former Free Speech and Expression Policy are largely replicated in B1, B2, B3, B6, C2, and D of the new policy. Direct updates to the statements of the previous policy include that sound amplification now may be permitted when it "will not interfere with normal operations in an academic environment" when before sound amplification was entirely banned, and that event sponsors are now responsible for some event costs as per B3. While the previous policy merely stated it was "not intended to limit distribution of printed material relating to Institute affairs", section B5, C1, and E of the new policy introduces several specific guidelines for written material.

The new policy adds onto the former policy by establishing rules for a wider range of activities. Notably, section B4 of the policy bans camping on campus (without explicit permission), likely in response to pro-Palestine encampments put up as part of recent protests at other campuses, such as UCLA and MIT. Section A specifies rules intending to address disruptive or dangerous activities.

Four days after the announcement of the new policy, a new email from President Rosenbaum and Provost Tirrell addressed three protests that had occurred since the new policy. This announcement stated the "events have been peaceful, and the protests did not impede or disrupt campus research, education, or operations", but that the protests nonetheless violated the Free Speech and Expression Policy because "the Institute was not notified of the events in advance by an authorized campus organizer." The email warned that those violating campus policies are subject to disciplinary measures.

THE CALIFORNIA TECH
LLM-FREE SINCE 2023!

Songs to Beat the Arcade Racing Game High Score To

Sophie Elam
Culture

I guess I should start with a formal apology. I tried. I really did! But despite my best efforts to not cave into the demons telling me to go down the EDM/techno/house rabbit hole, here we are. But in all honesty, I feel like it's pretty fitting. I'm out here trying to emulate "living in a video game" vibes, and it's hard to find anything more effective than EDM to accomplish this. That being said, the first few songs are more alternative, but pretty quickly I descended into madness and the EDM demons won. But it's ok, because if you channel your inner demons to this playlist, I can almost guarantee you that you'll beat the high score for the NASCAR simulator game at your local arcade.

1. Tokyo Drifting- Glass Animals
2. Sail Away- courtship.
3. I must apologize- PinkPantheress
4. You & Me (feat. ELIZA)- Flume
5. Shiner- Indian Summer
6. Fortune Days- The Glitch Mob
7. COLMILLO (feat. Jowell & Randy)- Tainy, J.Balvin & Young Miko
8. Unholy (ACRAZE Remix)- Sam Smith & Kim Petras
9. Magents (feat. Lorde) [A-Trak Remix]
10. All the things she said- Robin Schulz
11. Electric Feel (Dallask Remix)
12. Teka- DJ Snake & Peso Pluma
13. BANG YOUR HEAD- Diesel
14. Leavemealone- Fred again.. & Baby Keem
15. Blow (Cirkut Remix)- Kesha

Hot takes from the passenger princess:

Sail Away is genuinely one of the vibiest songs to ever exist. Sure, it may not have the fastest tempo or infinite bpm, but it sure as hell is cruiseable if you know what I mean. I decided that it would have been an injustice not to include it on the playlist, so I hope you appreciate it as much as I do even if it's a little out of place.

Originally, this playlist was going to be "Songs to Go Drifting through the Canyon to" in reference to the drive from Caltech to Malibu because it's such a pretty, fun drive (and if I had a sports car and no fear of speeding tickets, I would definitely attempt some questionable driving there). One of the songs I originally intended for the playlist was Magnets because of its reference to Mulholland Drive (which is accessible from the canyon). Naturally, not wanting to leave a great song off the list, I found a remix and threw it on.

Diesel is Shaquille O'Neal. Need I say more?

Hopefully, there are enough of you out there to enjoy the EDM side of life; the rest of you can just try your best to get the vibes. I'm also not gonna lie, good video game music = good study music, so take that for what you will!

Vroom vroom,

The new kid at the arcade

Songs to Beat the Arcade Racing Game High Score To (Spotify)

Songs to Beat the Arcade Racing Game High Score To (Apple Music)

"Risk" Single Review: Gracie Abrams is Back

Emily Yu
Culture

Los Angeles native singer-songwriter Gracie Abrams released "Risk" on May 1, over a year since she last had new music.

Abrams initially gained traction in 2020 with her honest and personal songwriting, showcased on her EPs (minor, This Is What It Feels Like) and singles such as "Stay" and "Mess It Up." Since then, she has performed as an opener for Olivia Rodrigo's SOUR Tour and released her debut album Good Riddance. Abrams was also an opener for Taylor Swift's highly coveted Eras Tour in 2023 and will return to the tour when it comes back to North America at the end of this year.

"Risk" marks a shift away from the mellow sounds that Abrams has become known for. When she sings, her voice is breathy and almost sounds like a whisper. In an era where much pop music is unremarkably overproduced, Abrams' voice conveys the authenticity of the lyrics she writes. Her earlier work, reminiscent of Phoebe Bridgers and Lorde, is characterized by those airy vocals and a melancholic aesthetic. For instance, Good Riddance is permeated by a haze of subdued acoustic guitar and lo-fi synth production. In comparison, "Risk" is more brisk and vibrant. Speaking to SPIN magazine about the track, Abrams says it was inspired by "the mania before you actually even know someone, where you get it all sick and twisted in your head and feel like you have a fever and can't control your body and mind."

Co-written with Abrams' childhood best friend, Audrey Hobert, "Risk" does not disappoint in displaying Abrams' knack for writing emotionally charged lyrics. The song describes the excitement of having a crush on someone new, then the subsequent thrill of falling too fast for a fantasy—"God, I'm actually invested / Haven't even met him." To describe the state of being infatuated, Abrams sings the poignant lines "And I wake up / In the middle of the night / With the light on / And I feel like I could die."

The music video for "Risk," directed by Hobert and released alongside the song, dramatically portrays how attraction can feel. In the video, Abrams is lovestruck and fervently chases her crush down a dark, empty street, among other impassioned actions.

"Risk" continues Abrams' streak of intimate and candid songs. The song will be the lead single for her upcoming sophomore album The Secret of Us, due to come out on June 21.

The Secret of Us

Amazon Skymall

Welcome back to Amazon Skymall! In this column, we hold a raffle where we [not] randomly select one of our lucky readers and give them the item of their choice from these hand picked selections!

Enter this week's raffle by using the QR code or the link below:

Large Grade A Eggs, 12 Count
$7.99

Bling Glitter License Plate Frame
$7.99

NO
NO
Free

Tamagotchi Original - Sakura
$19.99

Metal Portable Telescoping Back scratchers
$9.99

47inch Giant Water Injection Bubble Ball
$15.99

Last Issue's Winner

AJ Torres (Ricketts '25, ME) won the Star Wars Stormtrooper Decanter 25Oz, Transparent Creative Flask Carefe, Whiskey Carafe for Wine, Scotch, Bourbon, Vodka, Liquor - 750ml Valentine's Day Gift for Men/ Husband/Boyfriend/Father/Dad

BIO ZAR

Life with a Brain Implant: Interview with clinical trial subject James Johnson

Sanvi Pal
Edited by Professor Richard Andersen, Kelly Kadlec, James Johnson
Science & Tech

When I applied to Caltech, I applied because I was in awe of Professor Richard Andersen and the work he and his graduate students have done with brain machine interfaces (BMI), devices that are able to both pick up neural activity and transmit signals to the brain.

The Science Picture

BMI systems can be openloop or closed-loop. Open-loop means that there is a pre-programmed system output regardless of what the user is thinking. Closed-loop means that the subject is now integrated in the loop and has control over system output. There are two kinds of BMIs, "write-in" and "read-out". A "write-in" BMI transfers electrical pulses to send signals to parts of the brain. An example of a "write-in" BMI is Deep-Brain Stimulation which is a treatment option for people with Parkinson's Disease where electrodes are used to stimulate motion related areas of the brain to decrease tremors. A "read-out" BMI records brain activity. These "read-out" BMIs can be invasive (require neurosurgery and/or implantation) or non-invasive (devices reside on the skin of the scalp or skin near relevant muscles). Examples of recording devices used in "read-out" brain machine interfaces are EMG (Electromyography), ECoG (Electrocorticography), EEG (Electroencephalography), fMRI (Functional Magnetic Resonance Imaging), fUS (functional Ultrasound), and intracortical arrays. EMG records electrical activity from skeletal muscles and EEG records electrical activity from the scalp. ECoG records electrical activity from the brain surface (cortex). fMRI uses magnetic fields to measure changes in blood flow and oxygen levels and this is used to identify the tasks certain brain regions are responsible for (can also be used to direct location of implants). fUS uses ultrasound to record changes in blood volume. Intracortical arrays have tiny microelectrodes that pick up electrophysiological signals from neurons (signals caused by action potentials).

The Andersen Lab is involved in invasive brain machine interface research related to decoding electrical signals from the brain. Decoding involves taking in raw brain signals and using machine learning and mathematical algorithms to map patterns in neural activity to signal(s) representing the subject's goal.

The Andersen Lab uses linear decoders. Their continuous decoder employs linear regression which maps certain channels of activity to motion. For example, their subject will initially be in an open loop run of the task, during which they follow along with movements made by a computer controlled cursor as their neural activity is recorded. To give the subject control in closed-loop, the data in this run is then used for the initial training of the decoder and gives information about channels of activity/what neurons are predictive of x direction and what neurons are predictive of y direction. The outcome of this regression are weights to neurons based on the neurons' involvement in the motion. While some actions like controlling a cursor on a computer are more continuous in nature, other actions like clicking the mouse, can be considered discrete. For this case, the Andersen lab also has a discrete decoder which does linear discriminant analysis classification to make movement choices before the movement. A critical step in training both continuous and discrete decoders is choosing what features of the neural activity—an electrical signal—are actually predictive of the participant's intentions. In the beginning of the study, they used threshold crossings (for each channel the number of times the voltage crosses a threshold) to train the linear decoder, but now they use a neural network for feature extraction. The neural network, called FENET, identifies relevant neural activity based on a broadband signal which includes both multiunit activity and spikes. This advanced feature extraction is needed because over time the signal degrades. When the patient first gets hooked up, brain control is fantastic using traditional methods (i.e. threshold crossings). Over time it takes more effort and the implant shifts. FENET (developed in collaboration with the Emami group) is able to fill in the blanks on the signals. It restores the level of control to what it was at the start of the study.

The Human Picture

In the field of Neurotechnology, there is a lot of work being done to use brain machine interfaces to help people with motor disabilities regain lost abilities. When reading Professor Andersen's papers as a high schooler, I remember thinking: this is the kind of research that can help a lot of people. That's why, in my second year of being an undergrad here, I jumped on the opportunity of taking CNS 256 Brain Machine Interfaces with Professor Richard Andersen. His graduate student Kelly Kadlec (Neurobiology, G6) has had a huge role in structuring this class as well, and I greatly appreciate her work.

In one class, we all got the opportunity to have an inspirational conversation with James Johnson, a clinical trial patient at the Andersen Lab. James is tetraplegic; he can't move anything below his chest, can't close his hand, and has a fractured but not severed spine.

James has been a member of this study for 6 years. He has received two implants of Blackrock's Utah Array (an intracortical array), one in the left posterior parietal cortex (region in the brain responsible for planning motor decisions) and one in the left motor cortex (region responsible for sending motor commands to the spinal cord). The Utah Array is a 4 mm x 4mm 128 microelectrode array made by Blackrock that can record and stimulate neurons for decoding applications. James works with the Andersen Lab 3-4 days a week and participates in 2-3 hour sessions a day. The Andersen lab uses the sessions to collect data and tries new interfaces for James to test. In these sessions, James does various tasks like play video games or move a cursor by thinking about the action. In this setup, he is able to "will things to move" as he is able to cause movement on the screen from his thoughts.

It was truly inspiring to meet with James and hear first hand experiences about the surprising scope of abilities unlocked from neural decoding.

Interview with James Johnson

Q1: Why did you join the study?
A: Before the injury, I was both a respiratory therapist and a registered nurse who'd worked in many hospitals throughout California. Working in healthcare gave me the opportunity to give back and help people. When the accident occurred, I was utterly devastated to discover I had lost movement. Naturally, I wasn't hesitant to participate in the program because I felt it was an opportunity to give back again.

Q2: Did you have any reservations? What was your perspective going into the surgery process? What parts of it were scary and what parts were exciting?
A: I worked with many individuals that had brain issues. I was familiar with where they wanted to place the electrodes/chips so I wasn't scared about that. I was most concerned about what I look like afterwards. I wasn't really concerned/afraid of the procedure itself.

Q3: What was the surgery process like?
A: I wanted to see the surgery so I asked someone to record it. I found it cool to see my own brain. They opened the whole scalp and skull to put in the electrodes. I also was surprised with how long it took. It took 8 hours.

Q4: What were your initial thoughts?
A: I thought I felt like a Jedi. I was willing things to move. You have that sensation that you are special. Over the past five years, I have been pushing my abilities to its limits. I love gaming and we are playing chess and call of duty. I also love art and am able to make things with a workshop at home through photoshopping. When we first got started, it was very fatiguing to will something to happen. It's like going to the gym for the first time and lifting weights. Over time you build more stamina and muscle. Weight lifting becomes easier and you advance to heavier weights. That is how it feels to will something to move on the screen. I took time to adapt to tasks that were asked. I really needed to harness energy to focus on the task at hand and over time the tasks got harder.

Q5: Describe the strategies where you are attempting to move in the way you move and how that differs?
A: First, I was told to imagine my thumbs following the target. This was easy for me as I was able to immediately imagine moving the joystick in a game controller with my thumb. The control I had was dependent on muscle memory. So it was simple to imagine moving my thumb. After three months, I was able to use thoughts instead of actively imagining my hand doing something. This requires a lot of concentration.

Q6: Describe different types of willing movement (controlling with the mind vs body parts)?
A: One experiment I did was speeding up the cursor. First, I thought about moving the cursor with my hands. Eventually I was asked: can you move the cursor with your feet or knees? When I try to use my foot, it takes a lot of effort. Maybe it's the distance the neural pathways need to follow but I felt more fatigued. Over time, I built stamina.

Q7: How are sessions optimized?
A: Different signals light up when decoding. When I think of moving the cursor, different neurons send signals that the decoder can use. There are different regions of neurons that send signals based on what I am thinking about to move the cursor. For example, there are different channels that get tuned based on hand and foot movement.

Q8: Describe the session logistics.
A: I am able to go on for longer sessions now. Sessions are 2-3 hours. My mind does wander. This is obvious as the cursor on the screen pulls away. If I am having one of those days when I am struggling against the decoder, it is very fatiguing. I had built up stamina but there are those days when the decoder doesn't cooperate. I take 3-4 minute breaks to sort of reset before continuing the session.

Q9: What happens after some sort of holiday?
A: My fatigue and effort is the same as the last time I recorded. It is like riding a bike and running off. When I play a video game, the excitement precedes the fatigue.

Q10: Are there any tasks that you have done without viewing any screen?
A: Last week, postdoc Jorge Gamez was thinking we are using eye tracking. So in front of him, I tried to move the cursor without moving my gaze. It was very successful. I successfully moved the cursor and landed on targets. It is like typing or texting without looking at the phone.

Q11: What kind of sensations/motor ability does doing digital art require?
A: We need to train the decoder to have multiple digits [degrees of freedom for movement]. We need to click and hold to draw and fade. The decoder can be trained for the thumb or the whole hand. My hand is still and I imagine moving my hand.

Q12: Would you consider replacement (replacing limbs with prosthetics)?
A: Sometimes I work with manufacturers of Blackrock. We have below-the-elbow amputees. They gave one amputee a prosthetic arm. There is a chip that picks up muscle activity of the arm above amputation level. He can take off the arm and still control it. He can move the hand while it is detached. I want to see some bridge between different levels of spinal cord injury. So above the C4, make a device that connects from C3 to C6 so that the signal carries across the bridge. Bridging this gap between intact parts of the spinal cord can allow signal transmission and restore communication between the brain and body parts that couldn't move due to injury.

Q13: What should people who want to work with humans with brain implants know?
A: It is good to allow the participants to give input. This makes the subject feel that their input is valid and allows for a more cohesive relationship with the people you work with in projects. For example, I am able to develop tasks related to what I like to do [like video games and digital art].

Q14: What kind of things do you expect in the future? Do you have a vision?
A: I want to see brain-computer interfaces combined with functional electrical stimulation (FES) so that we can control robotic appendages or an exoskeleton. We need an exoskeleton to allow tetraplegic people to close fingers and grab things. I want to be able to send signals to external devices and will move according to my thoughts. FES is functional electrical stimulation and can use current to cause muscle stimulation that elicits movement. For people that are not amputees, we might be able to develop an exoskeleton to perform motor functions. We can be able to map the brain enough to have people that are paralyzed or partially paralyzed control movement.

Special thank you to Professor Andersen, Kelly Kadlec, and James Johnson for editing and helping me write this.
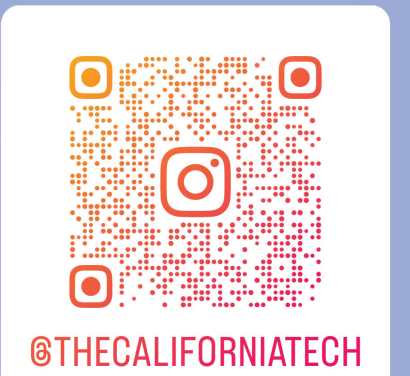
oh god how did i get here i am not good at communicating thoughts and feelings in a healthy and effective manner

are you good at communicating thoughts and feelings in a healthy and effective manner? join the tech!

Blacker Hovse Hosts *Gravity Falls*-themed Interhovse Party

...or Blinterhouse 2024: Gravity Falls

Maxwell Montemayor,
Alicia Zhang
Student Life

Last Saturday, Techers partied in the Mystery Shack during what many Moles consider to be Blacker's best interhovse since COVID. Themed after the cartoon, Gravity Falls, numerous patrons dressed as characters from the show and danced or moshed to curated sets played by live DJs, on a platform with a unique tarp "roof". Others took a break in the lounge or dining hall to partake in the many food options or admire the decorations, props, and mural.

Despite worries of low turnout due to Lloyd and Avery scheduling their beach trips on the same day, attendance and energy were still high. "I think it turned out well, especially seeing as a bunch of people from Lloyd and Avery returned early to come to Blinterhovse," says Blacker Hovse President, Juan Luchsinger (ME '25, Blacker).

"I left beach trip for interhovse; worth," says Gael Moran (CS '25, Avery), who was part of a group of Averites who left their beach trip early to attend Blinterhouse.

This year, Blacker stepped up their DJ game. "It was hype, especially the trap session" says Jason Kamau ('27, Page).

"We had different approaches to sets," explains Albert Huang (CNS '27, Blacker), who helped set up the DJ booth and did some DJing himself. "Some were pre-mixed (with smooth/professional transitions) and some were fully on-the-fly (requests + whatever we thought of by vibes)."

"That was my first time DJing... I really want to do it again," says Tyler Gatewood (CS '27, Blacker). "It was extremely fun, energy was pretty contagious throughout the whole set."

Ricketts' resident DJ and President, Ramzi Saber (Ay '25) lent his DJ board to Blinterhovse and helped train some of the DJs. "The hardest thing about interhovse in my opinion is appealing to everyone's music taste, but [Blacker] did a great job on that," he says. "A lot of these interhouses have just a Spotify running, but actually getting up there and transitioning manually is a skill and a half so mad respect to y'all."

Planning began months in advance and construction began in late March. Moles still could be seen running around the hovse, making last-minute preparations all the way up to the 10pm start time.

Food Frosh Nat Hernandez (Geo '27, Blacker) led the house in making a creative array of home-made dishes inspired by Gravity Falls. These included a carved watermelon jack-o-lantern and hand-wrapped Loser candy from the Summerween episode, Smile Dip (modified Fun-Dip), along with rainbow swirl cupcakes, cookies, pumpkin bread, and coffee cake. The food prep team cut hundreds of cheese triangles which resembled Bill Cipher, the golden triangular villain of the show.

"Well... that was the most stressful thing I ever did... you're rushing everywhere running up and down stairs making sure food gets done and still making food yourself," says Hernandez. "But it got done thanks to the help of my wonderful fellow moles."

Blinterhovse attendees made sure to stop by and snap pictures of this year's epic mural, which featured characters Ford Pines and Bill Cipher in an apocalyptic version of the titular town of the show.

"It was so much fun being the art frosh!" says Art Frosh Eloise Zeng (ME/CS '27, Blacker), who designed the mural and led its creation. "The mural turned out better than I predicted... IMO it looks pretty fire."

The 16 ft by 25 ft mural was painted on a massive piece of muslin fabric sewn together by moles, which was draped over the usual explosion mural. "People were very supportive... and many helped with [the] mural in a lot of ways whether it was sewing, moving scaffolding, or driving us to stores," says Zeng.

This year's platform featured an ambitious roof element: a white tarp supported by rope that was hung over the main dance platform like a tent, which reached over halfway up to the Sholm Hovse roof.

"We were trying to make it look like the Mystery Shack," says Ethan Labelson (EE '26, Blacker), who is part of Blacker Hovse Damage Control and has worked with administration to pass the extra fire safety and construction checks that the roof required. "Honestly it turned out better than I expected," he says.

The platform consists of a bridge connecting Blacker's entrance walkway to a lower platform with mirrored stairs that lead to the upper dance floor, which feature the tarp roof and DJ booth. Many older Moles were excited to see this increase in platform complexity—a sign of recovery from what Covid had done to construction creativity and efforts.

"Before my time, we used to build pirate ships, triple-decker platforms, flood the courtyard, and for a while, it felt like that kind of thing was behind us—but this felt like a return to form," explains Nico Adamo (CS '24, Blacker).

Neev Mangal (CNS '27, Blacker) was one of the 3 workfrosh who helped lead construction. "It was a pretty big time commitment... about 3 hours a day. Near the end it becomes 5 hours a day, including weekends," says Mangal. Though, he claims the large time sink did not meaningfully impact his academics, saying "I think it was worth it... the more work you have the less time you spend watching Instagram reels."

However, some Moles felt the pressure of completing the platform on time. "We could have had more hands in ratio to our plans...Our ambition does not match our labor force," says Tyler Gatewood.

Even more miraculous than Blacker completing construction in the nick of time was the lack of noise complaints from the neighbors—so a good time was had by all. Perhaps the tarp helped absorb some of the noise from the party.

Moles spent weeks working on numerous hand-crafted lounge projects. Impressive crafts featured a paper-mache Waddles the pig and Giant rat, a metal cage, clouds that hung from the dining hall ceiling, and a rainbow streamer and fairy lights chandelier display.

Emily Nikas (Ch '26, Blacker) built and painted a whole 7ft tall tree made of layered foam board, tape, insulating foam, and plaster. She had worked so hard on the tree, that she had to nap during some of Blinterhouse.

Ahaan Shetty (Ph '27, Blacker) led the construction and painting of a whole miniature Mystery Shack spanning 5ft wide and 8ft tall in the center of Blacker lounge. "[It's] super meaningful to have everyone contributing over a long period of time, and a great bonding experience," says Shetty.

Preparing for interhovse as well as the party itself instilled a strong sense of Hovse camaraderie in many Moles. "Blacker interhovse is the highest effort of all the interhouses in terms of construction, decoration, and lounge projects," claims Shetty. "It's in [the] Blacker spirit to be building stuff together, that's what made it great overall."

"It was also crazy to me how working on interhovse felt so natural and genuine this year" says Adam Krivka (CS '24, Blacker).

Blacker senior Nico Adamo describes his Blinterhouse experience: "hit the floor, threw ass to Shakira up there alone like a ten-cent whore while the Flems stared at me and ate mini corn dogs. Sang some Sheeran, spent about 2 hours in bed, came back for emo music and then stared wistfully into the night, contemplating the aging process".

"Leaving this year is bittersweet for a lot of reasons," says Adamo. But his last Blinterhouse was something that made him feel confident that he was "leaving the house in the hands of some of the most incredibly capable and passionate people I've ever met."

Photos courtesy of Maxwell Montemayor and Alicia Zhang

This is just like that one episode of Phineas and Ferb

layout by Michael Guutz

Our glorious dystopia began one summer afternoon,

when two local boys were caught building and riding a dangerous roller coaster.

The rightful reaction by concerned parents' groups was to stop all creativity in young people, before someone got hurt.
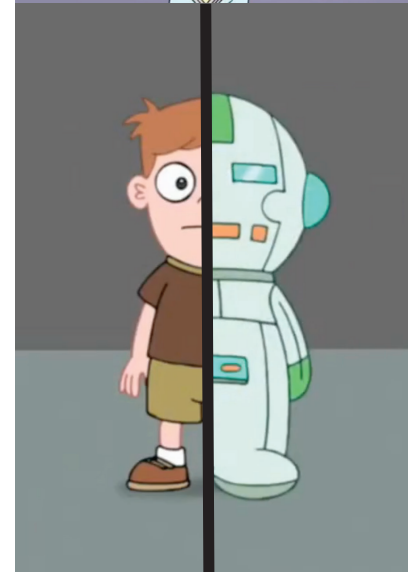
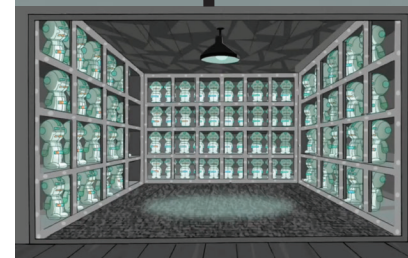Everything fun and unique was gleefully banned.

Dangerous swing sets were remade into dismal hospital beds.

Coloring books were colored in, ahead of time and inside the lines.

Eventually, children themselves were childproofed,

and stored away until adulthood.

Yes, oppressive beauty and happiness

were gratefully replaced by the glimmering cesspool

we wallow in today.

A demoralized student body cried out to be oppressed. That cry was answered by one hero.

Come on, OSE isn't the bad guy

Meg Robertson
Opinion

The Office of Student Experience (OSE), hosted in that little yellow house at the corner of Hill and Del Mar, is comprised of:
•residential experience,
•student engagement and event management,
•first-year programs,
•finances and operations, and
•the faculty in residence.

However, for undergrads at least, when we think of the OSE, the main topic that comes to mind is event registration. In my time as Ricketts Hovse President, I heard many complaints about this process — from their denial of rotation event proposals, to their attempt to pass off their Bechtel event as an interhouse. I AM frustrated, don't get me wrong. I think that some of the events that were denied should be approved, and I think that some of the events that OSE has hosted have been poor in taste. However, the OSE is NOT the bad guy.

Too often, staff in the OSE office are villainized for simply doing their job. If an event is deemed unsafe, too loud, breaking a hazing policy, etc, there is often an uproar from the students. While I also dislike it when somebody tells me that I cannot do the event I had planned or I need to reconsider aspects of it (99% of cases), too often students fail to put themselves into other students' shoes, and most times OSE has a good reason for intervention.

When you imagine a typical Caltech student, what do you picture? Maybe a student looking to squeeze one more hour in the day to finish the set due tomorrow? Too real for me. OSE is looking to care for this student — the student who just wants to go to college, have fun, and succeed academically. OSE is here as a resource and safety net for these students. When the houses propose events that are unpalatable to students who may not be as "into" house culture, often these events are asked to be reconsidered.

"OSE sucks because they won't let us have more alcohol at our event!" — What about the students who then have to live with the smell of vomit outside their door for days on end?

"OSE is the worst because they treat us like children!" — What about the students who feel unsafe around the students who act like children?

I'm not saying OSE isn't wrong sometimes. I disagree with them a lot, particularly regarding intervention in house culture. What I want us to consider, however, is that the decisions that the office makes are meant to make the students' lives more eventful, equitable, and safe — even if they fall short in execution.

P.S.– Constantly shit talking OSE lowers morale more than OSE ever could.

AUDITIONS

for

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Be a part of the full production this fall!

Open to all Caltech/JPL community
Performance dates: November 2024

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Auditions: 12-3pm, May 25, 2024
(Alternate times available upon request.)

Questions? Email brophy@caltech.edu

Produced by Caltech Theater, as part of the Getty Pacific Standard Time festival.

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TAKE THE CONFIDENTIAL

NCHA Survey

SCAN ME

5.06.2024 - 5.26.2024

Look out for the email with subject line: "Time to Represent Caltech in the 2024 National College Health Assessment (NCHA)!"

Student Wellness Services   **@caltechwellness**

National College Health Assessment: We Need Your Participation!

Every two years, Student Wellness Services invites all currently enrolled Caltech students 18 and older to take the National College Health Assessment, or NCHA. It's a confidential national survey that asks about health behaviors such as exercise, sleep, alcohol use, mental health, and more. You should be done in less than 30 minutes.

The NCHA will be live from Monday, May 6th to Sunday, May 26th. You'll get your survey link on Monday, May 6th - watch for the subject line, "Time to represent Caltech in the 2024 National College Health Assessment (NCHA)"

The NCHA is Wellness Services' single most useful way to gauge how our students are doing overall in terms of their physical and emotional health, and to see how we compare to other universities. Remember, your responses are confidential, and everyone who completes the NCHA will be entered into a drawing for $1,000 worth of giveaways just for Caltech students! Keep your eyes open on Monday the 6th.

Prizes include:

- Nintendo Switch
- Bose noise-cancelling headphones
- North Face backpack
- Lululemon belt bag
- Kinto tumbler

Sponsored by Student Wellness Services

In Brief...

The Brinson Exploration Hub

As has been recently announced, Caltech is fortunate to have received an endowment from The Brinson Foundation to form The Brinson Exploration Hub, a unique implementation organization where we consider success to be a deployment, expedition, or mission. The Brinson Exploration Hub aims to enable the advancement of our scientific understanding of Earth, the solar system, and the cosmos, and is currently developing the structures necessary to support these endeavors.

Projects undertaken by the Brinson Exploration Hub must address the following 5 pillars:

1. Implement breakthrough exploration projects that drive scientific and societal benefit.
2. Produce a new generation of "space savvy" alumni.
3. Execute with speed, agility and risk tolerance.
4. Seize emerging opportunities in the broader ecosystem of Earth and Space exploration.
5. Respond to the strategic ambitions of both Caltech and JPL.

We are now requesting feedback from you via a Request for Information (RFI) form available at https://forms.gle/C9bVsWTYicGZvaZB9

This feedback will assist us to structure the programs and associated calls for concepts.
* THIS IS NOT A CALL FOR PROPOSALS - we expect a call to be issued end-of-summer.
* If you have multiple concept ideas, feel free to submit multiple surveys.
* Responses are due by May 27, 2024.
* Please contact Rachel Etheredge (rethered@caltech.edu) with questions.
* PLEASE DO NOT CONTACT THE BRINSON FOUNDATION DIRECTLY.

—THE BRINSON EXPLORATION HUB

The California Tech Sponsored Workout

Lilia Arrizabalaga
Category

As your friendly neighborhood former Dabney Athman, I have a great passion for trying to get people to go to the gym. As part of these efforts, I would like to give you a nice example workout.

Dumbbell Bicep Curls with Static Hold
- This exercise will help give you the strength to hold a newspaper for the prolonged time it will take you to read it

Farmers Carries
- A classic exercise that will prepare you for hauling 200 newspapers through a cold Boston morning to deliver the Tech.

Push Ups
- My number one exercise, pop a copy of the Tech in front of you while you do them to remind you of proper form keeping your head in line with your spine.

Burpees
- This one has nothing to do with the Tech, I just like making people suffer

Warm Up:
Arm circles 10 seconds each direction
1min jumping jacks
30s arm swings
Circuit (do each exercise, rest then repeat x4):
10 Dumbbell Bicep Curls with Static Hold
10 Push Ups
30s Farmers Carries
10 Burpees

Cool Down:
Do some static stretches to cool down, then grab a copy of the Tech and read through it for good measure.

The California Tech
CalGuesser
#11

Every issue we'll show you a different location on campus. Find the place and find the QR code hidden there to sign the log book and **win a fabulous prize?!?!**

"On campus" is defined by the bounds of the map on caltech.edu/map/campus.
The QR code will be hidden somewhere within the pictured area.

Last issue's winners!

CalGuesser #10 – April 26, 2024

Congrats, you found it!!!
Leave your name/pseudonym, year/department, and date found!

michael guutz (FIRST!)   April 11, 2024

Lee C., 4/26/24   Alexi, 4/26/24
                                              Max Junior 26th o aprill
Bernoulli 4/26/24   Karyn M 4/26/24
                                          Ji
                                          Jiatong April 27th
Lilian Dove, ESE, 4/29   Kristen Bazua, MCE, April 30